



## INTRODUCTION

This book has been prepared as a hand-book for teachers in the basic craft of cardboard modelling. It should be remembered, however, that according to the basic syllabus, cardboard work does not constitute a basic craft complete in itself, but forms the first step in the craft of cardboard, wood and metal-work considered as a whole. This book, therefore, is only the first in a series to be completed later. It contains instructions in the technique of cardboard modelling, with a description of the necessary material, tools and equipment and a graded model series. It also tries to indicate how this basic craft can be used as a medium of education, not only for the recognised school subjects—such as mother-tongue, mathematics, social studies and general science—but also for the training of children in the habits of co-operative disciplined activity, a training which forms an indispensable part of this new scheme of education.

A basic craft, as laid down in the Report of the Zakir Husam Committee, must fulfil two essential conditions, both educational and economic. "It must be rich in educational possibilities, that is, it should find natural points of correlation with important human activities and interests, and should extend into the whole content of the school curriculum." Secondly, it must be a productive craft in the real sense of the word, i.e., it must have its own place in the scheme of national economy. It must be a craft that fulfils one of the fundamental human necessities; the necessary raw materials must be available, and the tools and equipment required must not only be of the simplest, but they must be in keeping with the economic standard of this country.

Both agriculture and spinning and weaving abundantly fulfil the above conditions. They supply the fundamental human needs of food and clothing. Our country is essentially an agricultural land, where cotton also is extensively grown. Both these crafts with their various processes cover almost all the important aspects of human interests and activities and all the different branches of human knowledge. They have, therefore, been accepted as two basic crafts of universal

importance. The craft of cardboard, wood and metal-work constitutes a similar craft of fundamental importance, both educative and economic. A knowledge of the processes of wood and metal-work is necessary for building houses, for fashioning vehicles and agricultural implements, and for manufacturing the simplest human necessities in the shape of utensils, furniture and tools for spinning and weaving. Whereas children of school-age cannot undertake all this actual work, yet their work on smaller models, suited to their age and strength, introduces every one of the processes necessary for the manufacture and supply of these fundamental necessities. They can gain in school all the necessary knowledge and ability to enable them to produce these without difficulty at a later stage.

Moreover, as with the crafts of agriculture and spinning and weaving, this craft also covers so many aspects of human activity and is so widely inter-related with the life of nature that it can with equal advantage be adopted as a medium of education. All the subjects of the curriculum can be as easily correlated with it as with the two previous crafts.

It is obvious, however, that whatever might be its educational value, wood- and metal- work cannot be adopted as a basic craft for school children under the age of nine, on account of their sheer physical inability to handle the tools necessary for working on hard material such as wood or metal. Paper cutting and cardboard modelling have therefore been evolved as a preparatory training to the basic craft of wood- and metal- work, since both paper and cardboard are softer varieties of the same fibrous material as wood, and the techniques of their manipulation are fundamentally similar. Though paper-cutting provides an interesting introduction to the educational process for little children under seven, it cannot be adopted as a basic craft for children above seven. While working with paper, we are creating only images of actual objects. To be educative, handwork must be productive in the true sense of the word, i.e., the things produced must be actually objects of utility. Though they may provide temporary occupation and interest to the children, toys and playthings cannot provide the sustained and developing interest which is essential for a craft that is to form the medium of education. It is also a matter

of experience that children do not derive the same creative joy from making useless objects of entertainment as from making objects of actual utility.

On the other hand, cardboard modelling fulfils all the conditions necessary for an educational craft. Objects prepared from cardboard are both useful and marketable. The tools and equipment necessary are very simple and the practice of the craft requires a maximum use of the hands and a minimum number of tools. It is also an easily acquired craft. The children soon experience the joy of finished products which is so necessary to sustain their interest. The processes of cardboard modelling require both frequent practice in measurement and calculation, and familiarity with geometrical forms. Thus mathematical training forms an integral part of the craft training. The knowledge of the materials and tools required in the craft work leads naturally to a knowledge of historical and geographical facts, conversation relating to the processes in craft work, and to materials, tools and equipment, together with oral description and written records, will provide the introduction to language training. This aspect of the craft of cardboard modelling has been elaborated later in the chapter on correlated teaching. The little that has been said above is, however, sufficient to indicate the educative value of this craft as a medium of education.

Besides the rich educational possibilities, this craft has also its economic significance. It is a fact of common experience that a large number of cardboard articles in the shape of files, portfolios, writing and blotting pads, trays and boxes is used in offices and educational institutions. Fancy articles of cardboard are also used by chemists, druggists, perfumers and other business men. All these articles are at present imported from foreign countries. There are great possibilities of developing this craft as an educational medium which will in time become a flourishing cottage industry, and thus successfully eliminate foreign competition. The craft needs very few tools and all the material necessary in the shape of cardboard, paper and cloth can and should be made by hand.

Cardboard modelling in its present form has been newly introduced in the field of education, and stands in need of many enthusiastic

workers. This book is a pioneer attempt to present this craft to students and teachers and to those interested in the revival and development of cottage industries in India.

If it succeeds in arousing the necessary interest and enthusiasm and in creating future workers, the author's labour will have been rewarded and the purpose of the book fulfilled.

Wardha,  
27th September, 1939

Lakshmiswar Sinha

# TEACHERS' HANDBOOK

## CARDBOARD MODELLING

### CHAPTER I

#### MATERIALS, TOOLS AND EQUIPMENT

##### Material :

##### A BASIC MATERIAL

(a) *Cardboard*—As is evident from the title, cardboard is the main structural material required for our work. Two main types of cardboard can be had in the market—whitish and brownish. Whitish cardboard is usually used by artists for mounting pictures. Brownish cardboard (sometimes also called strawboard on account of the substance from which it is prepared) though much cheaper, is equally suitable for the work of cardboard modelling. The standard size of sheets is  $30\frac{1}{2}'' \times 25\frac{1}{2}''$ .

This material also differs in thickness. We should choose cardboard of medium thickness only for most of the models to be prepared in schools. Thin or very thin cardboard is required for making round boxes, whereas a thick quality is used for making large boxes, trays and files. Schools which adopt cardboard modelling as a basic craft should stock cardboard of the different thicknesses required in school work. In the description of the model series, the thickness of the cardboard required has been indicated. Both ounces and seers are commonly used to state the weight per sheet.

Cardboard also differs in its origin. Most varieties offered for sale in India are of foreign, mostly Japanese, make. Some Indian paper mills (e.g. at Lahore and Titaghur) also manufacture cardboard.

(b) *Paper*—We use coloured paper to mount articles prepared from cardboard for the same reason that we use plaster to coat houses. Mounting protects the structures from exposure to the natural destructive elements and thus gives it a longer lease of life. Besides fulfilling this useful purpose, mounting also serves the aesthetic purpose of decoration.

Paper used for mounting can be classified as follows :

1. Coloured or designed paper for mounting models on the outside

2. Paper of a lighter coloured design for mounting the interior and both sides of the base of a model such as a box.

A wide variety of mounting papers of foreign origin particularly Scandinavian may be purchased in the market. Considerable quantities of these are used by our book-binders. Apart from reasons of national economy, machine-made paper is not suitable for use in basic schools, as it lacks the higher aesthetic quality necessary for a handicraft. Moreover, since hand-made paper is stronger than machine-made paper, it is more suited for educational purposes. Plain sheets of hand-made paper should be coloured or designed by the pupils themselves under the guidance of a teacher. This gives the pupils an opportunity of creative self-expression, trains their artistic sense, and enables them to become acquainted with the different shades of colours, it thus becomes an essential educative factor. Ordinary paper may be used in the lower classes for colouring, drawing and mounting. For albums, portfolios and similar articles, thick mono-coloured hand-made paper should be used.

Blotting paper is required for pads and portfolios of different sizes for various uses. In this case again hand-made blotting paper of different shades is recommended.

(c) *Cloth*—We can obtain in the market special varieties of foreign cloth, of various colours and designs, which are known as binding cloth. These are in great demand by book-binders for purposes of both binding and mounting. In cardboard work also such cloth is used as binding material. In the case of a handicraft however, for both educational and economic reasons the use of mill-made material should as far as possible be avoided. It gives a cheap effect, and articles thus produced lack the simple beauty and dignity which must always be an essential quality of handwork.

Cloth is used for mounting where paper is not considered strong enough. Printed Khadi\* is very suitable for use as a mounting material as in softness, texture and beauty it fulfils the highest aesthetic standard. When Khadi is used as mounting material, for

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\* Hand-spun and hand-woven cloth.

harmony's sake the binding cloth should also be of hand-made material.

*The method of making binding cloth*—Select a piece of mono-coloured Khadi and cut strips of the required breadth. Cut strips of brown packing paper of the same breadth. Apply thin flour paste to the paper, carefully place the strip of cloth upon it, and fix them together by hand, or by passing a roller over them. When dry, the finished article may be used as binding cloth. Strong binding cloth of durable quality may be made from any kind of cloth or silk, by the same process.

It should also be noted that leather may be used as a material for binding and mounting. However, the technique of mounting an expensive material, such as leather, is beyond the scope of the present book, which is intended for teachers and pupils of basic education.

(d) *Extra Material Required*.—In addition to the materials mentioned above, a few other small articles, such as coloured tape, book-binding thread etc., are required in cardboard work. In place of coloured tape or ribbon, hand-spun yarn may be dyed and the strands twisted to form a cord for binding purposes. The number of strands required and the number of times it will be retwisted will depend on the strength of cord required. Such small articles are detailed in the description of the relative models.

## B FASTENING MATERIALS

*General*.—Fastening material is required in cardboard work, to fix together such structural materials as paper, cardboard and cloth. Several varieties of expensive patent fastening materials—mostly adhesive mixtures—may be obtained in the market. However, in schools and training centres the teachers and students should prepare their own adhesive paste from materials easily available in the locality. This paste will not only be cheaper, but it will have the further educational value of acquainting the students with the nature and preparation of fastening material.

(a) *Flour-paste*.—Flour-paste is generally used by our book-binders. It can always be easily and freshly prepared as required. Mix flour ( $1/8$  of a seer) with fresh water (1 seer), and see that the mixture is free from any foreign substance. A little blue vitriol powder may be added to the mixture, which should then be boiled



until it is cooked and becomes sticky. The blue vitriol added makes the paste thus prepared insect- and worm- proof. While it is boiling the mixture should be continually stirred with a clean stick to ensure that all particles of flour are uniformly cooked and that the paste is free from the clots which sometimes form on account of uneven heat. The thickness of the paste must depend on the nature of the work. For ordinary use, the paste should be so cooked that it runs freely from the brush. This paste can easily be prepared both at home and in school.

(b) *Gum*—Dry gum, in pieces or small cakes, can be purchased in the market. Break it into still smaller pieces and put them in a bottle with water. In twenty-four hours the gum will dissolve. Place gum in the sunlight before using.

(c) *Glue*—Glue is usually required in woodwork to join two pieces of wood together, but it may occasionally be used in cardboard work, especially for fixing very thick pieces of cardboard. However, glue need not be specially prepared for use in cardboard work. It may be borrowed from the woodwork section.

Glue is manufactured from animal refuse, such as hoof, horn or skin, which contains a substance known as gelatine. It is sold in cakes. The best quality of glue is insoluble in cold water. It must be broken into small pieces, soaked in cold water, and boiled by indirect heat.

(d) *Mounting paper and its preparation*—Our book-binders purchase various varieties of foreign mill-made mounting paper known as “marble paper” for use in mounting books, files and similar articles. However, as has been previously stated, when a handicraft is introduced as a basic craft for educational purposes, every process of the craft should be performed by hand, and as far as possible all the materials used should be prepared by hand and not by machinery. Therefore, it is strongly recommended that whenever cardboard modelling is introduced as a basic craft, all mounting paper used should be coloured and designed by the students and teachers themselves. The process of designing papers with colours is an old art which was well known to the illuminators of manuscripts, both in the East and in the West. Beautiful specimens of their handiwork can still be seen in the museums. Even today, the art is not entirely lost, and is practised by some of the best book-binders of the world.

This process fascinates children and provides them with a great field for self-expression. It not only allows full play to their imagination, but cultivates their taste, and by acquainting them with the tints and shades of colours and their composition, it forms an integral part of their general education. The colouring of binding-papers should therefore be considered an integral part of the syllabus of cardboard modelling as a basic craft.

The actual process is very simple and requires so little effort that it can easily be performed by a child under the proper guidance of a teacher. It requires only an understanding of the nature of the papers on which the colours are to be used. It should, therefore, be introduced after the children have prepared a few useful models with mono coloured paper as mounting material, and have thus gained some knowledge of its properties, and an elementary acquaintance with colours. This will minimise wastage of colours and of paper.

*Materials*—The materials required for this work are paper, paste and colours.

*Paper*—Ordinary blank inexpensive white or cream coloured good hand-made paper may be used for this purpose.

*Paste*—Thin flour-paste, no thicker than barley-water, should be prepared to mix with the colours.

*Method*—Any colour which is soluble in water may be used, but vegetable colours are the most suitable. First dissolve the colours in water and then mix the flour-paste. Place a pad of old newspapers under the sheet to be coloured. Apply the mixture of paste and colours from end to end, with quick long sweeps of a broad soft brush or a cotton sponge. No part should dry until the whole sheet is finished.

If a design of more than two colours is required, the colours should be applied in the form of flashings, sprinkling and lines or spots here and there, or in other ways as desired. When this method is used, the paper may be handled in different ways to achieve different results. The simplest way is to fold the coloured surface along the middle and press together lightly with the hand or a wooden roller. When opened, the paper discloses a natural and beautiful design. The additional colours used make various designs against the background of the first colour. (See coloured plate No II—Fig. nos 2 and 5).

The interior mounting paper should be of a less prominent colour

than the exterior mounting paper. Light colours or tints are more suitable for interior mounting. In all cases, the colours must be harmonious.

*Other Methods.*—1. The bare fingers may be used on colour. We can play with our fingers on colours as we play on a musical instrument. See plate no. 1—Fig. nos. 2 and 5.

2. Various designs may be achieved by the use of brush.

3. Wooden blocks or stamps of different designs may be used.

4. A rough ball or roller of waste paper may be rolled over the colour. During rolling, a flush of colours may be dabbed here and there. The paper may then be folded and rolled as has been previously suggested. (See plate no. 1—Fig. nos. 1, 2 and 3).

5. A rough comb may be made from a piece of cardboard and drawn over the colour. This may be done in many ways, to produce different designs. (See plate no. 1—Fig. nos. 4, 5 and 6).

Since the coloured sheet of paper will be cut into smaller pieces for use in mounting, the designs should never be big. When big designs are cut up for use, they never give the desired effect of completeness. During colouring, the size and nature of the model on which the papers are to be used should be taken into consideration.

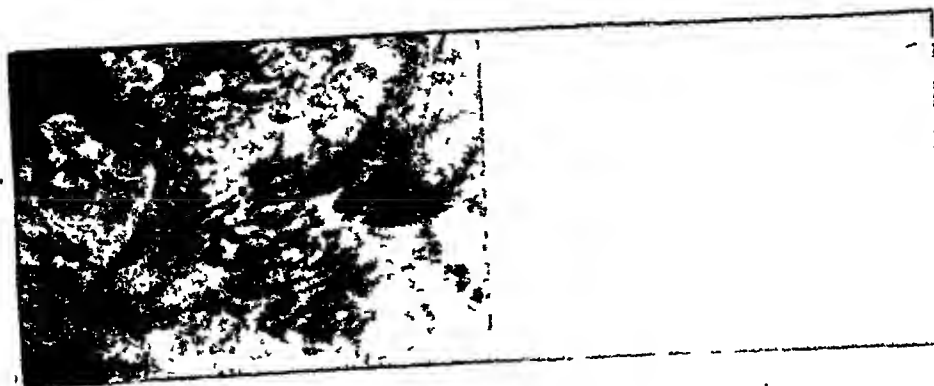
Colouring if unsuccessful at first attempt may be recoloured; no paper need be wasted.

The coloured and designed paper sheet should be hung on a string or spread out on a plain table to dry. When working, we should take into consideration the fact that much of the brightness of the colouring will fade during the drying process. The flour-paste used for colouring should be neither too thick nor too thin. The correct proportion can be learnt only through actual experience of the art.

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# HAND-COLOURED MOUNTING PAPER

PLATE No I

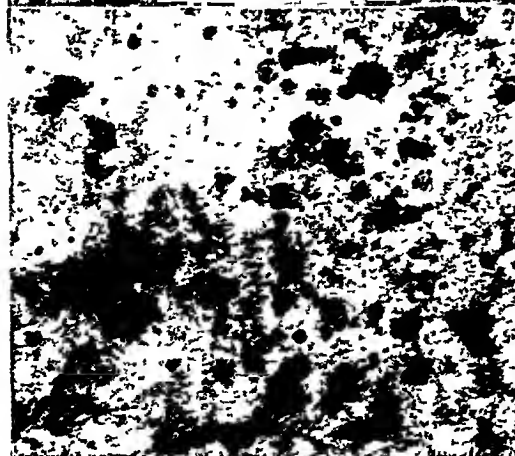
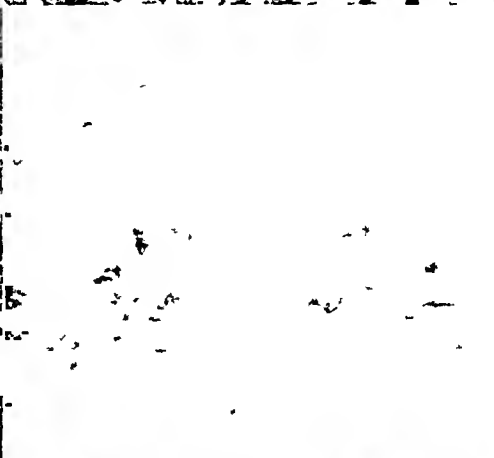
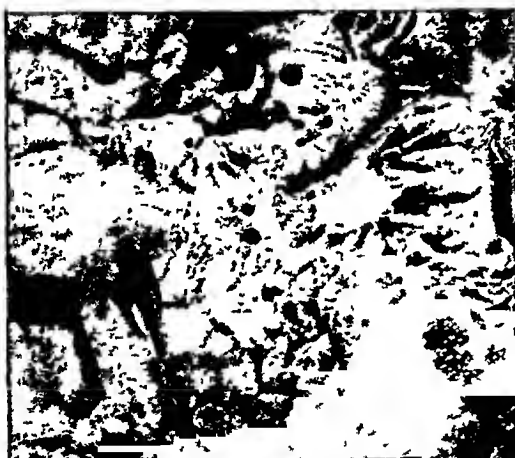
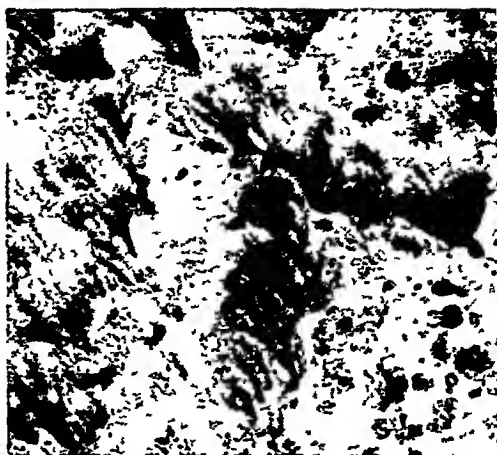


Other methods

Various effects of combing

# HAND-COLOURED MOUNTING PAPER

## PLATE No II



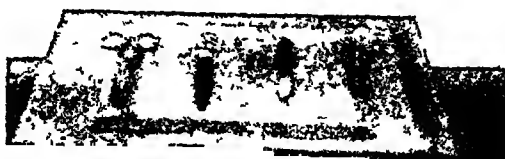
1 Combing, 2 Finger treatment, 3 Use of different colours, flushing 4 Use of different colours—paper against paper 5 Use of mixed colours—finger treatment 6 Light coloured paper for inside mounting

# TOOLS AND EQUIPMENT

Each pupil should be provided with the following tools (plate No 1 ).

*a* Working-board, *b* knife, *c* scissors, *d* smoother,

PLATE No 1



Simple Tools and Working Board

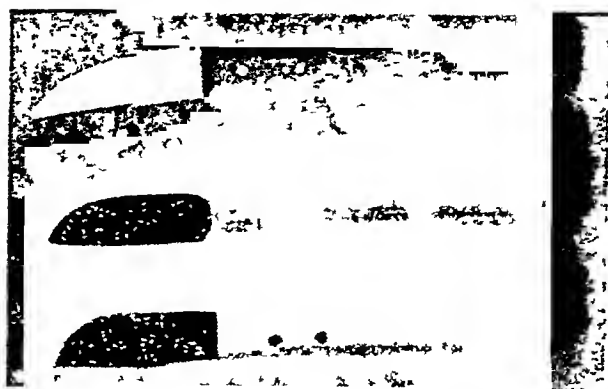
*e.* divider; *f* scale In addition, a L-square must be provided for the use of the class.

(*a*) *Working-board*—The working board should be made of any kind of durable, strong, heavy wood which is locally available. A wood such as teak, seasoned and of dense grain, is the most suitable.

The size of the board will depend on the age of the pupil and the nature of the work. 60 cm × 40 cm × 5 cm is a suitable size for a child in school. As the board is meant for use with the knife, and for pasting, it may be mounted on both sides with thick pieces of cardboard, of the exact size of the board, to be fixed at the corners with drawing pins. These will serve as a protection and lengthen the life of the board.

(*b*) *Knife* (See plate No 2 )—Knives of three kinds, suitable for class work, are shown in the picture. The blade should never be more than 2½" long and ½" broad. The handle of a knife should be so shaped that it will in no circumstances roll on the table or any other flat surface. Therefore, the handle should not ordinarily be round, but if it is round, the diameter of the handle should be less than the width of the blade, after taking into consideration these essential points, modifications in the size of blade or handle are permissible. In these matters, teachers must be guided by experience. They should always try to get their tools made locally.

## PLATE No 2



Specimens of knives locally made  
 (a) Knife with flat handle  
 (b) Knife with round handle.  
 (c) Knife with handle of another shape.

(c) *Scissors*.—Any strong pair of Indian-made scissors is suitable for the work. For children of seven plus, these should not be more than 15 cm in length.

(d) *Smoother*.—The smoother is a simple instrument and can be made locally of bamboo, wood or bone, whichever may be easily available. It is intended for use in smoothing down the sharp edges of the cardboard after cutting, and before mounting. It is often helpful in mounting the inner surface of a model. A convenient length is 15 cm.

*Construction*—Take a piece of bamboo, about 15 cm. long and 2 cm. broad. Make approximately three-fourths of it into the blade, with both edges bluntly sharpened, and one-fourth of it into handle. (See plate No. 1 ).

(e) *Divider*.—Many different varieties of dividers are available in the market. A divider with arms 15 cm. long may conveniently be used for the work. One good type of divider has a wing such that, when the divider is closed, it passes through a slot in the opposite leg. There is a screw to fix up the legs at a required set. These arrangements help to mark the points of measurement on the piece of cardboard before cutting.

(f) *Scales*.—Ordinary metal scales, not smaller than 12" or 30 cm. with both inch and centimetre marks boldly defined, are suitable for this work.

(g) *L-Square*.—Various kinds of iron L-square are available in the market. They may also be made locally of wood, with iron strips at the edges.

In both the L-square and the try-square, the implement consists of two portions, the stock and the blade, but in the L-square both are of the same thickness. Therefore, it can be used flatly on both cardboard and paper.

*Extra tools and equipment necessary for a class.*

The following tools will be required for a class of fifteen to twenty students. In no circumstances, should the number of students admitted exceed twenty.

- (a) One scale—24" or 36" in length
  - (b) One big pair of scissors
  - (c) One small hammer
  - (d) One or two hand-punches
  - (e) One circle knife which can be locally made by a smith.
  - (f) One dozen ordinary paste brushes
  - (g) One dozen ordinary earthenware pots for paste
  - (h) One tin vaseline (to be applied to metal parts of tools while not in use, during vacation).
  - (i) A supply of rags or two dozen small napkins to keep the fingers free from paste and dirt
  - (j) A saucepan or pot for preparing paste.
  - (k) A stove—if necessary.
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## CLASS ROOM AND EQUIPMENT

No room of special size or shape is necessary for cardboard work. Any well-ventilated class room or enclosed space will serve the purpose. A room 45 ft. by 25 ft is an ideal size for a class of 30 students, *i.e.* approximately 38 sq. ft per student. The size of class-room required may be determined accordingly. When weather conditions permit, classes should be held in the open air.

Rough portable working tables, allowing a minimum space of 22" for each pupil, are recommended for equipment. Corresponding benches may also be provided, but for reasons of health and efficiency the standing position is more suitable for working hours. If the children are to work seated on the floor, mats and plain low tables should be provided. For outdoor classes, the students and teachers may themselves prepare low earthen platforms in the shade of a tree.

A closed almirah or rack with two or three shelves is useful for storing such material as cardboard, paper etc., as well as the products of the class, both finished and unfinished.

*Tool Box*—Each pupil should have a wooden or strong cardboard case for his tools. When the pupils have learnt the technique of making boxes, they may themselves make such boxes of strong cardboard. A separate holder of binding cloth or leather should be prepared for each of the tools. In course of time, each pupil should make a box for his own tools, and be held responsible for them. This will not only help him in his work in the period for basic craft, but will be a part of his general education in civic life.

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## CHAPTER II

### FUNDAMENTAL TECHNIQUES IN CARDBOARD MODELLING

There are six fundamental techniques in the process of cardboard modelling

(a) Cutting cardboard. (b) cutting paper, (c) smoothing sharp edges, (d) pasting, (e) dealing with the expansion of mounting materials. and (f) pressing

(a) *Cutting cardboard* —Put the L-square on the piece of cardboard to be cut. Two methods of holding the L-square firmly and gripping the knife are shown in plate nos 3 and 4

Keep a steady grip on the knife. holding it without swerving

PLATE No 3



Proper way of cutting  
cardboard

either to right or left, cut firmly along the required line. then follow the same impression from beginning to end. and cut the piece with a

few strokes. The cuts should be clean and straight, and at right angles to the adjacent side.

The teacher should first demonstrate to the pupil the right method of holding the knife and the L-square. The cutting will nevertheless prove a little difficult for a young pupil or a beginner in spite of all his efforts to the contrary. The L-square will glide away and the knife move astray. This is only due to wrong handling of the knife. The point of the knife is slipping at an angle under the L-square, and is thus pushing it out of place. Beginners also tend to use their full strength when cutting, not realising that a little strength is sufficient for this purpose. When once the pupils have experienced these initial difficulties the teacher should give them proper instruction and help in these matters. They should first be asked to use a knife of the right degree of sharpness on a piece of thin cardboard. The teacher should again demonstrate the right method of holding the implement and the material, explaining the errors in the pupil's technique. He should now see that the L-square is firmly held, and the knife gripped at the right angle, while the actual cutting is done with firm but light strokes.

The cardboard should be so placed on the working board that the knife runs against the grain of the wood, that is to say, the breadth of the board. The teacher should explain that when the knife cuts against the grain, it cannot cut deeply into the wood and the board will thus last for a longer time.

Proper methods of cutting should be insisted on right from the beginning, and then the right habits will soon be formed. The strength and beauty of a perfect model depends to a great extent on this technique, which also saves wastage.

(b) *Cutting Paper*.—When cutting paper the paper should be folded, and firmly creased with the smoother or the finger nails. The knife should be kept flat on its side, and the full length of the sharp edge of the blade should be inserted. The cut should be clean and sharp. The process of cutting paper may sometimes be spoilt because of some roughness in the working board, and it may be helpful to place a piece of cardboard between the paper and the working board. Keep the knife sharp always.

(c) *Smoothing*.—When cut, cardboard is always more or less sharp at the edges. Unless these edges are smoothed, in course of time and by force of friction, they will cut through the mounting

materials Therefore, before mounting, all the edges should be systematically smoothed with a few forceful strokes of the smoother. A smoother should always be kept clean.

PLATE No 4



Proper method of cutting paper  
Observe that the knife is held  
in a reclined position

(d) *Pasting*—Before beginning to paste, cover the working board, say with an old sheet of newspaper. Place on this the article to be pasted. Stir the paste with the brush. Beginners are apt to use too much paste, but this error may be avoided if the brush is shaken gently against the edge of the paste pot. Place two fingers of the left hand on the paper and hold it firmly. Then apply paste gently from end to end. Do not rub. Pasting must be uniform. The use of too much paste will soften the mounting materials and spoil the appearance of freshness. When using a brush, select a broad one by preference, since it is desirable to finish the whole process of pasting quickly, before any part of the article has time to dry. One must be careful to see that no paste adheres to the reverse side of the paper and to keep the metallic parts of tools free from paste.

The brush should always be kept clean and soft. A cotton pad may be used instead of a brush.

(e) *How to deal with the expansion of mounting material and control bending.*—The application of paste often causes a slight expansion in the paper to which it has been applied. The paper stretches a little lengthwise, that is, in the direction in which the paste-brush is applied. The rate of expansion depends on the quality of the paper. Always cut the piece of paper 2 or 3 mm. shorter than is actually required, and when pasted in that direction it will come up to the right size.

Binding cloth also stretches when paste is applied. When mounting, the above method should be used, but the expansion may be ignored in the fastening of corners and similar processes. Hand-made binding cloth tends to stretch less than machine-made varieties, since it has been fixed on to the paper by hand, instead of being rolled by machine.

*How to control bending.*—Due to the effect of the wetness of paste or gum cardboard tends to grow soft immediately after mounting. Therefore, when only one side is mounted, the board tends to bend inwards. The board absorbs the watery paste or gum, and the mounting material tends to pull the sides on account of the dampness. Therefore, whenever it is necessary to mount a piece of cardboard both sides should be mounted at the same time. The absorption will then take place on both sides simultaneously, and its effect will thus be neutralised.

(f) *Pressing.*—Most models made of cardboard require to be pressed immediately after pasting. The model should dry and receive its proper form under the press. The working board should be used for purposes of pressing. It is also useful to keep a few clean pieces of wood and stone for the use of the class and to use them when heavy pressure is required.

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## CHAPTER III

### THE MODEL SERIES

*Introductory remarks*—Since cardboard modelling is the first step in the basic craft of cardboard, wood- and metal- work, like all other crafts adopted, it should have a definite plan to serve a definite purpose. The models to be executed should be such, and should be so arranged as that :—

- (a) they may be made in schools, and the operations involved may not be beyond the mental capacity and physical ability of the pupils;
- (b) they may be useful for practical purposes,
- (c) they may be a source of joy and a means of sustaining the interest of the pupils throughout the work;
- (d) they may demand the use of a minimum number of tools and the maximum co-ordinated effort of hands, eyes and brain;
- (e) they may help the child to understand the why and wherefore of every process involved;
- (f) they may enable the children to acquire confidence and self-reliance,
- (g) they may serve as a means to an end;
- (h) they may provide a means of natural correlation with other subjects of the basic syllabus,
- (i) The exercises involved in making a particular model, and in the model series as a whole, should be like a ladder with easy steps

In consideration of all these points, the following exercises or model series form a systematic course intended to provide ample practice in tool manipulation through work itself. They afford ample scope to make this particular craft a factor in basic education and a stepping stone to the manipulation of harder material,—first wood and then metal, as suggested above

The manipulation of tools, the handling of materials and the technique of working out the models. have been arranged in progressive sequence. The arrangement of the model series is such that each fresh model incorporates exercises included in previous models, with some fresh exercises not previously practised, but arising naturally out of the work already done. It will be found that when once a process has been performed, the steps of that process are not repeated in the instructions. It is taken for granted that the pupil will be able to execute that part of the work without further instructions. Thus the whole model series forms one complete unit.

Although it may appear that some of the earlier models are too simple in character. we must understand that the choice of models has been based on experience. The lessons have been so arranged that each and every pupil can prepare any given model without direct help from the teacher. The teacher should be there to assist the pupil in his effort to conquer difficulties. but the pupil himself should do the actual work. No step in any process should be missed. It should be noted that technical or geometrical terms, such as line. square. circle. rectangle. etc.. are not introduced in the early stages. When the children have become familiar with the qualities of a line. a square, etc., by constant practice and handling, and are able to recognise it from its properties. then they may be introduced to the correct technical or geometrical term.

The course prescribed in this book is intended to help teachers in their work with children and adults alike. and it may be enlarged or modified in the light of experience to suit any local or special requirements. Though the teacher should not be bound by any hard and fast method of work. nevertheless there should be a system and a method, otherwise the teaching work is bound to suffer from lack of continuity and from overlapping. If such a change be made. the alteration must be made bearing in mind the completeness of the model series.

Before starting work. the pupils should see and examine a specimen model. The teacher should demonstrate the implications of tools and techniques involved in executing a new model. Such demonstration requires little or no explanation. Let the children observe the teacher's actions. Demonstrations should never be repeated unless they have been misunderstood. The teacher should demonstrate to the students as a group, but while the class is at work, he should

pay individual attention to the personal difficulties of each student. Class instruction should be systematic and thorough

Occasionally the children express a wish to make toys or to try other new experiments. Such extra activities should be encouraged over and above the actual work laid down. This work may be done in school hours, more especially in connection with social festivals or dramatic performances.

It will be borne in mind that in the syllabus prescribed by the Zakir Husain Committee each child is expected to execute a minimum number of eight models during the course of his first year's work, and eight models during his second year's work. The number has been intentionally kept low in order that each model executed may be of perfect workmanship and finish. The child may thus not be hurried in his work. He may not only thoroughly assimilate the actual processes of craft work, but may have ample time to reap the maximum educational value of the craft.

To sum up, the whole scheme of work should form a contributory factor to the development of the child and his personality; the teacher should guide the work so that the pupils may feel that they themselves are working, counting, reasoning and reflecting.

### PREPARATORY MODEL SERIES (SEE APPENDIX A.)

The Preparatory Model Series is meant for children just entering school or for those who have received no previous sense training. These preliminary lessons in folding and free-cutting will enable them to handle scissors and paper. In the first instance, we must not expect accuracy in cutting to a line. With practice this will soon come as a matter of course, and lead on to the next step of cardboard modelling.

*Folding and Cutting*—In these preliminary exercises, the correct method of holding paper and manipulating scissors should be insisted upon.

The paper to be folded should be placed flat on the working-board and the edges should be turned down and folded as may be required for any particular piece of work. The left thumb should always be firmly placed on the left hand side of the paper, and the extended fingers on the upper edges. With the right hand the pupil should smooth the paper from the edges towards the line, using the



right forefinger for creasing. During cutting, the paper should be held with the left hand with the thumb on the upper surface. Beginners usually use only the points of the scissors when cutting, whereas the full length of the blade should be used.

In the beginning, pieces of paper of the required size should be prepared beforehand by the teacher and distributed to the children. Only mono-coloured paper should be used.

During these preparatory lessons, the inch has been introduced as the unit of measurement, so that the children may become familiar with what is at present the common standard unit of measurement in India. During the model series the centimetre has been introduced as the unit of measurement, since, being a smaller unit with decimal divisions, it permits of greater accuracy in measurement. It has the additional advantage of giving the children an idea of the decimal system.

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## CHAPTER IV

### A FEW SUGGESTIONS ABOUT CORRELATED TEACHING

The previous three chapters have been devoted mainly to technical instructions in the processes of cardboard modelling, together with a description of the necessary material, tools and equipment. Even this bare description should have been sufficient to indicate that the craft can be utilised for purposes of general education. For instance, every model executed obviously necessitates a great deal of measurement and calculation, together with an increasing familiarity with the common geometrical forms, and practice in the four elementary mathematical processes of addition, subtraction, multiplication and division. Thus, as has been previously pointed out, mathematical training forms an integral part of the training in cardboard modelling. Moreover, the constant handling of such materials as cardboard, paper and cloth, of different texture and thickness, will train the pupils' senses and provide the foundation for future scientific education. History and geography, both of our own and other lands, will be gradually introduced by discussions of the history of the craft and of the method of preparation of the different materials used. The decoration and designing of mounting paper will provide opportunities of creative self-expression and give the children the necessary artistic training—above all, the discipline of co-operative productive work, necessitating habits of co-operation, sharing, accuracy and planning, will form the basis of training in citizenship which is one of the fundamental aspects of basic education.

The above suggestions are merely an indication of the rich educative possibilities of cardboard as a basic craft. These possibilities will have to be developed and elaborated on the basis of actual work with the children in the basic schools, and in the training centres. As we evolve the method of weaving the whole process of education round the nucleus of craft work, we must accept the children as our teachers and guides. If the atmosphere of the class is truly educational, and the children are left free to follow their own initiative and natural curiosity, seeking the teacher's help and guidance when it is needed,

they themselves will guide the process of learning until the entire content of the curriculum is naturally correlated to their central occupation—the craft.

Therefore, the essential qualification for a teacher of basic education is a full faith in the educational possibilities of craft work, and a respect for and understanding of the child's curiosity—his natural approach to the process of acquiring knowledge. The child must be left free to explore and make his own discoveries in the field of knowledge; the teacher's role is only to guide him and help him in his difficulties. This process will prove educative for both the teacher and the child.

Here we make only a few suggestions to help a teacher in presenting a lesson on cardboard work to the children. These should be accepted as tentative suggestions and may be modified and developed as a result of actual experience of work with the children.

A model correlated lesson on the first cardboard model is annexed to this chapter and extracts of some correlated lessons on the preparatory models for the first grade, will be found in App. B., together with suggestions for the method of planning the work, and the practical work to be done by the class.

Experience proves that if the teacher's work is carefully planned beforehand, the children's efficiency is more readily achieved and correlation with other subjects becomes more interesting.

When planning a lesson, the teacher should bear in mind the following points:—

1. Tools should be introduced at the psychological moment in the course of the work—i.e., when the work necessitates their use.

2. When the students are at work, tools should be kept in their proper places—either on the right hand or the left.

3. The working board and the tools and materials should always be kept clean.

4. Materials should be introduced as occasion arises. The graded lessons should always include such information as the cost of the materials used, the source from which they are obtained, the raw materials from which they are made, the method of manufacture, etc.

5. The pupils should come to regard all arithmetical and geometrical problems which arise naturally in the course of the work,

as a subject for discovery. The articles made or under construction should be compared, and their forms noted.

6. The teacher should plan his practical work in units that coincide suitably with the time available in order that the practical work may always be stopped methodically at a convenient stage, taking into consideration the fatigue points and the points of correlation.

7. The teacher should discuss the points of correlation which occur incidentally in the course of the work and should drill the children by asking questions to each child individually.

The following points should be noted with regard to correlation —

1. Subjects such as folk tales and stories, which have no direct bearing upon the craft work, should be taken separately on convenient occasions. For instance, when sharpening and examining tools, the teacher may introduce stories of primitive man and the tools which he used before the discovery of iron. Each individual festival provides an opportunity for the teacher to introduce stories connected with it. An eclipse of the sun or moon provides an opportunity for stories bearing on these phenomena. The outbreak of an epidemic provides a practical opportunity for health education. Before imparting any such information, however, the teacher should be sure that the children's interest in the subject is thoroughly aroused.

It must be borne in mind that all correlative phenomena are interconnected. When the child has gained one piece of knowledge through actual experience or correlation, he is better able to discover other similar phenomena, it is an accumulative process. The child cannot conceive an abstract idea without concrete support. The correlative links in the work are many, and can never be complete. The teacher must use his discretion and consider their relative importance, bearing in mind the age, health, and environment of the children.

3. School activities should form the main basis for social studies, which the pupils are expected to assimilate from actual experience. School environment and activities should reflect ideal social conditions which alone can give the children the sense of true citizenship and encourage enjoyment of co-operative activities.

The teacher must avoid executing any part of the pupil's craft work. If the child experiences any difficulty in the execution of the

work. the teacher may discuss with him how best to overcome that difficulty, but if the child is to reap the full benefit of the sense of achievement as a result of successful intelligent effort, he must always execute the actual work himself.

The following general suggestions for the planning and execution of a craft lesson with its correlations will be found helpful.

Before the children begin work on the model itself, some time should be devoted to general discussion regarding the work to be executed. A completed model, preferably made by pupils of the former group, should be demonstrated, or better still, should be actually given to the children so that they may get an opportunity of discovering for themselves how it is made. Let the children discuss fully the shape, the colour and the make of the model, and then let them measure it carefully. This will give the teacher opportunities of associating the work with mathematics and mathematical drawing.

Next the teacher should guide the children to an examination and analysis of the materials and tools necessary. For instance, when first taking up cardboard modelling, the children should be helped to discover for themselves how and out of which raw materials cardboard and paper are made. The teacher should distribute small pieces of thick paper among the children, and let them tear them carefully to pieces and discover for themselves that paper and cardboard consist of fibres—fibres of trees. Next he may show them a piece of fibrous wood—and let them arrive at the conclusion that wood, paper and cardboard are primarily composed of the same fibrous material. Then he may show them or ask them to suggest some other varieties of fibrous matter—such as cotton, hemp or jute. This may be followed up by the observation of local plants and plants life, and thus lead to nature study and general science.

If and when possible, the children should be taken to visit a local paper-making centre and helped to know what different raw materials are required, and to understand what are the processes necessary, in making paper or cardboard. Soon, the children will realise that although paper and cardboard are used for different purposes, they are essentially the same, their only difference being in thickness, stiffness and colour. In course of time, the children should also come to know the different standard sizes of paper and cardboard and the names under which they are sold in the market. It is advisable to have a collection of various specimens of paper and

cardboard in the school for purposes of demonstration. The children should also know the market price of each material, and should eventually be able to calculate the cost of the materials required for a particular model.

It is certain that this increasing knowledge of the materials used in the basic craft will be accompanied by a growing interest in and understanding of the work itself. These are two complementary parts of the same educational process.

We have not yet exhausted the educational possibilities of the material used for cardboard modelling. When we have examined the quality, the varieties, and the methods of manufacturing cardboard and paper, we can next explore the field of the history of paper. Questions as to the nature of materials used for writing before the discovery of paper, which nation first discovered paper, and how the art of paper-making was spread from one country to another, will introduce the children to the stories of the ancient civilisations of Egypt and China, and to the story of the medieval civilisation of the Arabs. A great deal of the geography of Asia can also be introduced to the children in a picturesque and living form through the story of paper. Similarly, the story of the rise and decline of the paper-making industry in India may serve as a first introduction to Indian history.

This programme may appear to be over-ambitious, but if the information is given incidentally in response to the child's actual desire for information, this knowledge will not prove a burden. We are apt to under-estimate the child's capacity for assimilation of knowledge. We forget that through his actual living experience outside school hours the child does collect a considerable amount of knowledge and information both relevant and irrelevant to his growth. Since this process of acquiring knowledge comes incidentally during the course of his daily activities he does not find it burdensome. The knowledge imparted in school has invariably proved irksome to the child because in the first place, the content of knowledge has not been related to his actual interests and activities, and in the second place, the method of imparting this knowledge has been unnatural and artificial. If we imitate the processes of life, relating the knowledge given to the craft activity, and imparting it incidentally, as the child's interest in his activity grows and develops we shall find the child's desire for knowledge and his powers of assimilating it fir

exceed our plans and estimates for his education. The child, and not the teacher, will serve as guide in the process of education.

The method which has been suggested for a fuller understanding of the materials of craft work may be applied equally effectively to the tools and equipment for craft work.

The children should never be asked to execute a model until they have discussed and fully understood its utility. Since, from the educational point of view, every model executed must be a useful object, this discussion may be utilised to open up fresh avenues of knowledge. In fact, there are infinite possibilities of exploiting this craft for purposes of education. If these possibilities are to be fully exploited, we must first produce teachers with faith in and understanding of children, and then develop a truly educational atmosphere free from restraint and impositions.

When sufficient time to arouse the child's interest in his work has been devoted to a general discussion of the necessary material, tools and equipment, and to the general utility of the model selected, the teacher and children should co-operatively plan out the work to be executed. We must remember that planning is an integral part of craft training and should on no account be neglected. With the help of the teacher, if necessary, the children should first attempt to gain an understanding of the shape of the model, and compare it with the shape of models previously executed. Incidentally, they will thus become familiar with the common geometrical forms, such as the triangle, rectangle, square, circle and hexagon. Next, the children should select the cardboard and paper required for the execution of the model, and should try to calculate the number and size of the pieces required, and the most economical and accurate method of cutting them out. The children should also try to find out what tools are necessary for each individual and for the class as a whole and they should themselves distribute these tools, taking the responsibility by turns. The teacher should only help them to discover the quickest and most efficient method of distribution. He should see that the children share their materials and tools, thus forming the habit of co-operative work which is one of the main objects of education through crafts.

The processes involved in the actual execution of the model have already been described in detail and need not be repeated here. The essential point to remember is that every process must be intelligently

understood and not merely mechanically repeated. For instance, the child must understand why, when cutting cardboard, he must use the knife in a particular manner, and smooth the edges after cutting. He must understand why an excessive use of paste tends to soften the mounting material, and why he should make allowance for the expansion of mounting material and binding cloth—how cardboard tends to grow soft immediately after pasting, and how mounting on both sides prevents it from bending. While actually working with their hands, the children should come to understand that each of these processes is based on some natural law, whose working should be clear to them. This is what Gandhiji means when he says “Every handicraft has to be taught, not merely mechanically as is done today, but scientifically, i.e. the child should know the why and the wherefore of every process.”

The completion of a particular piece of work should again be followed by a general discussion in which the whole class should participate. When a child has completed a model, he should be able to give a clear and full account of his work, describing the material and equipment required and the different processes involved. Later on, when he has some training in writing and drawing he should keep his own written records of work, illustrated with diagrams.

We now come to the question of the correlation of language training with craft training. Language training has two essential aspects—utilitarian and aesthetic. The utilitarian aspect of language training relates to the training of children in the proper use of language as a medium of communication of thoughts and ideas.

Education through crafts is far superior to education through books in the opportunities it gives the child of developing a living vocabulary and accurate expression. It is claimed that the child can develop all the necessary vocabulary if full advantage is taken of every opportunity which craft work affords for expression in language. The constant use of materials of different size, quality and texture, the handling of tools for the different processes of craft work, and the familiarity with different shape, form and colour give better opportunities for the development of vocabulary than can possibly be obtained from the mere reading of books. Moreover, the child's knowledge of words thus gained will be living and accurate. It is hoped that the child will learn to use his words with



care and will use in his verbal expression the same habits of precision which he has learnt in the use of his hands

From the above brief account it should be clear that besides training in the co-ordinated use of eyes, hands and mind, discussion, planning and actual execution of models in cardboard work provide ample opportunities for all the necessary education in language, mathematics, general science, social studies and drawing. If properly imparted, this training should also instil in the children habits of accuracy and planning, of sharing and working together, and above all, of intelligent enquiry, social and individual habits in which we are sadly deficient as a nation.

## HOW TO WORK WITH CHILDREN

### CORRELATED LESSON ON THE FIRST CARDBOARD MODEL—A SCALE

Teacher.—Now you have spent some time in school. You have learnt how to make articles from paper and carton and you know how to cut them out with a pair of scissors. Now we will make some useful things, like those on my table. Would you like to make such things?

Children—Yes sir.

T.—Well, you all know how to measure paper and carton. How do we measure?

C.—With a scale, sir.

T.—Would you like to have a scale of your own?

C.—Yes sir.

T.—Could we make it from paper?

C.—No sir.

T.—Yes, we could make a paper scale, but paper is *thin* and not *strong* enough. It would get torn very quickly. Let us think of something else, *stronger* than paper. What is this? *The teacher shows pieces of cardboard.*

C.—Yes sir, we can make a scale with this *thick* paper.

T.—Yes, this is a kind of paper, but it is *thicker* and *stronger* than paper. We call it *cardboard*. Have you ever seen cardboard before?

C.—Yes sir, bookbinders use it.

*The teacher distributes a few pieces of cardboard amongst the children. They try to tear them, and thus find out how strong the material is. They observe and examine.*

T.—What material is it made of? What do you see on the torn edges of the cardboard?

C—These are fibres.

T.—What other fibrous materials have you seen?

C—Some plants and trees have fibres.

T.—What local plants have fibres?

*Children enumerate—jute, cotton, sun-hemp, plain barks, bamboos, grass etc. The teacher has samples which he shows to the children, and explains which of these local materials can be used in making paper.*

T.—One day we will go to a paper and cardboard-making centre and see for ourselves how cardboard is made and what materials are used. Would you like to go and see?

C—Yes sir, certainly.

T.—Now let us make our model. We will each make a scale of cardboard. What length should our scale be?

C—Twelve inches sir.

T.—Yes, a scale is twelve inches long. Twelve inches make one foot, and so it is called a *foot-rule*. With this foot-rule we can draw straight lines. *He demonstrates with a scale of cardboard.* I made this a long time ago. I use it at home for measuring things and drawing lines on paper. A scale is a very useful thing, for we can measure things accurately with it. Would each of you like to have one?

C—Yes sir.

T.—Each of you observe, examine and analyse this scale. Then you can make your own scales. Is this made of paper?

C—No sir, it is made of cardboard, not paper.

T.—Paper and cardboard both consist of fibres. Why is one called paper and the other cardboard, although they consist of the same thing?

C—Paper is thin, but cardboard is thick.

T.—We use paper mostly for writing and printing purposes, and for making decorative articles, such as those which you have already made, whereas we can make really useful objects from cardboard.

Now let us begin to make our model. How shall we cut our pieces of cardboard—from a big sheet?

C.—Yes.

T.—How?

*Children think for a while.*

C.—We must measure with a scale, and cut with a knife.

T.—You are right. We need a knife to cut cardboard. Have you children ever seen a knife?

One of the children—Yes sir, my father has a knife. We use it sometimes to sharpen pencils and cut other small things.

T.—You must each cut your own piece of cardboard, so each of you will need a knife. You must be very careful with it, for it has a sharp *blade*. Watch how I cut this piece of cardboard with the knife. But now I need something straight, to help me to cut in a straight line.

C.—Yes sir, you can use a scale.

T.—Yes, I could use a scale, but the scale is not broad enough. and it is very light. It may slip when I press hard against it with the knife. Here is another instrument. *He introduces the L-square.* What is this? Have you ever seen it before?

C.—Yes sir, masons use it when building houses.

T.—How many parts has it?

C.—Two.

T.—Both equal?

C.—No sir, one is *big* and the other *small*.

T.—Do you see the *corner* where the two parts join?

C.—Yes sir.

T.—Let us look at the corners of the desks, the benches, the table and other furniture to see if anything in the room has L-square corners. *Children examine the furniture.* What do you find?

C.—The corners are the same as that of L-square.

T.—Now we must cut our pieces of cardboard to make our scales, and the corners of our scales must all be correct, too. We can make them correctly with the help of the L-square. *Demonstrates use of L-square.* We place the L-square on the cardboard for a firm support, and thus we can draw a straight line so that we may cut straight edges to our scale. (See pp. 17-18; correct method of cutting cardboard). We have only one L-square in the class, so we shall have to use it in turn. Each of you must wait for his turn,

but no-one need sit idle. You may do some other work while you wait. Once more—tell me, how long is a scale?

C.—Twelve inches, sir.

T.—How wide is a scale?

C.—Two inches, sir.

T.—Then each of you will require a piece of cardboard twelve inches in *length* and two inches in *breadth*. *The teacher writes these figures on the blackboard.* Here is a big sheet of cardboard. Let us see what size it is. Measure it.

C.—It is 30" long, and 26" broad.

T.—Well, it would take a long time to cut our piece from a big sheet of cardboard. See, I have prepared some strips of cardboard, so that you will each have to cut only once, to make your scale. This will save time. Let us see how many scales we can make from one strip. Measure the strip. How many twelve inch pieces can we get from it?

C.—We can make two scales from one strip, and there will be some left over as *wastage*.

T.—How many strips do we need for the whole class? *The children calculate—one strip for two, two strips for four—ten strips for twenty.* Distribute the pieces. *The children do so.* Now you require knives: one knife for each boy. So how many do you require? Take twenty knives from the stock and distribute them.

As you see, we must have a wooden board on which to place our pieces of cardboard for cutting. Here is a board. It is called a working board, because we work on it. What materials is it made of?

C.—Wood.

T.—Do you see the long strips on the board?

C.—Yes sir.

T.—We call them the *grain* of the wood. Wood is grained and it has fibres.

Now, before cutting the cardboard, I place it on the working-board, and cut with the knife against the grain of the wood. If we cut with the grain, the knife will cut deep into the wood. *He shows an old board.* Look, someone used a knife carelessly along the grain of the wood, and this working board is now uneven and useless. Will you remember this when you use your working-boards?

C.—Yes sir.

T.—If you do remember it, your board will last a long time. Never cut the cardboard directly on the desk. Each of you has a knife now? Keep the knife on the right-hand side of your working-board. Do you know why you should keep it there?

C—No sir.

T.—Because then it is near your right hand. If you keep it on the left side, you will have to move your hand across the working-board every time you need to use the knife.

Now, watch me again while I cut the cardboard on the working-board. Wait and see how I cut mine, before you begin cutting your own strip. How shall I mark the twelve inch length on the strip?

C.—We can place the scale on the strip and make a mark at every twelfth inch, with a knife or a pencil.

T. But if the scale moves even a little, the mark will not be accurate, and then our scale will not be correct. So we have an instrument for marking accurately. Here it is. You see, it has two *legs*, and one *wing*. We can adjust the legs and fix them at a given *set* with the screw, in the wing. *The teacher demonstrates, taking twelve inches in the divider. He fixes it and marks the edge of the strip correctly.* This is called a “divider,” because with its help we can divide things into parts of any required size. I have only ten dividers to distribute in the class of twenty boys. How shall we distribute them?

C.—Sir, we have also ten strips for twenty boys—one strip for every two boys. Here also, every two boys can share a divider.

T.—All right. Captain, distribute the dividers, one for every two boys. Set your divider to 12". Do it in the correct way. Fix the leg and mark out the length. Mark both edges of the cardboard, to get two points, then place the L-square on the points and cut the cardboard along the edge of the L-square, as I have done. *The teacher helps the children in marking out the length and cutting properly. When all the pupils are ready, he points out the sharp edges of the cardboard.* How shall we smooth the sharp edges? If you don't smooth them, they may be spoilt, and then the scale also will be spoilt. *He introduces the smoother.* You see, this is a kind of knife made of bamboo (or wood, as the case may be). It is very useful. We always need it to smooth down the sharp edges of the cut cardboard. You can have one each. There are twenty boys. How many smoothers will you need?

C.—Twenty.

T.—Distribute the smoothers. *He shows the proper method of smoothing* Make sure that all the corners of your cardboard are accurate. Control the *angles* Now your scale is made, but we must mark the inches on the scale and cut them with a knife. *When this is done,  $1\frac{1}{2}$ " and  $1\frac{1}{4}$ " marks may be made.* Make the marks deep and distinct with L-square and the knife. Now make the lines clear with pencil or ink. Write the inch numbers from 1 to 12. Now your scales are ready. It is interesting to make our own scales.

C—Yes sir.

T.—We will put them in a safe place for the time being, and when you go home, you may take them with you

Now we must collect the tools. Let us do it in a methodical way. How many scales, knives, L-squares, dividers and smoothers did you take? *The teacher names a boy and lets him recall them* Now re-count the articles. Each of you must clean his own board and collect the wastage. It will not take long

C—Yes sir, we will do it. But where shall we put the small waste pieces?

T.—Collect them and put them in that box. It is called a *waste paper box*. The room looks untidy and dirty if the scraps of paper and cardboard are scattered about. Whenever we see any waste pieces lying about, we should pick them up and put them in that box. We can send this waste to a paper-maker, and he will make it into big sheets for us.

Now you have made something useful today. What shall we do next? Well, just now we may go out and play a little

Fall into line and go out one by one. Wash your hands in turn. *The teacher takes the children out in a queue and lets them wash their hands by turn, seeing that no water is wasted.*

After recess, games, songs etc., the children return to the classroom in a file, and each quietly take his own seat.

T.—Today you have made something useful—you have made a scale. You have also made some things from paper. Do you know where paper was first manufactured?

C—No sir.

T.—Paper was first made by the people in a far-off country

named China It is a very big country. Have you ever seen a Chinaman ?

C.—Yes sir, I have seen a Chinaman selling cloth.

T.—What does he look like ? Is he like us ? *The teacher elicits from the child a description of the Chinese tradesman he saw. Would you like to hear the story of a Chinese king ? Tells the story in simple language...Then before going home the children sing some songs.*

N.B. This lesson may be so arranged as to last for two days. On the first day the children will measure and cut the scale, and on the second day they will mark it and finish it.

### SUMMARY OF THE LESSON

#### *Mother tongue.*

Cardboard—fibres—jute—cotton—sun-hemp—plain bark—bamboo—grass—foot-rule—blade—corner—length—breadth—wastage—grain—leg—wing—screw—angles—waste-paper box—thin—strong—thick—thicker—stronger—big—small—long—broad—set—China—Chinese—story of a Chinese king.

#### *Mathematics*

Method of measuring—proper use of a scale and its utility—form :—length, breadth and thickness—writing of numbers 1 up to 12. Oral arithmetics —(a) one requires one scale (smoother, knife); how many scales are required for a class of—children ? (b) one strip of cardboard makes two scales; how many scales can be made from 2, 3, 4 . . . up to 10 strips ? (c) two scales are made from one strip; how many strips are required to make 4, 6, 8 and 10 scales ? (d) two children can work with one divider; how many children can work with 2, 3, 4—10 dividers?

#### *Social Science*

Proper greetings—method of planning the work—distribution of tools and materials—sharing of tools and materials—where to put wastage and why—habit of speaking in turn—proper and distinct way of answering questions—how to use water for washing hands and drinking—why we should avoid wasting water—proper use of materials and tools and keeping them in their proper places—

consideration for the work of other children—general tidiness both inside and outside the class-room

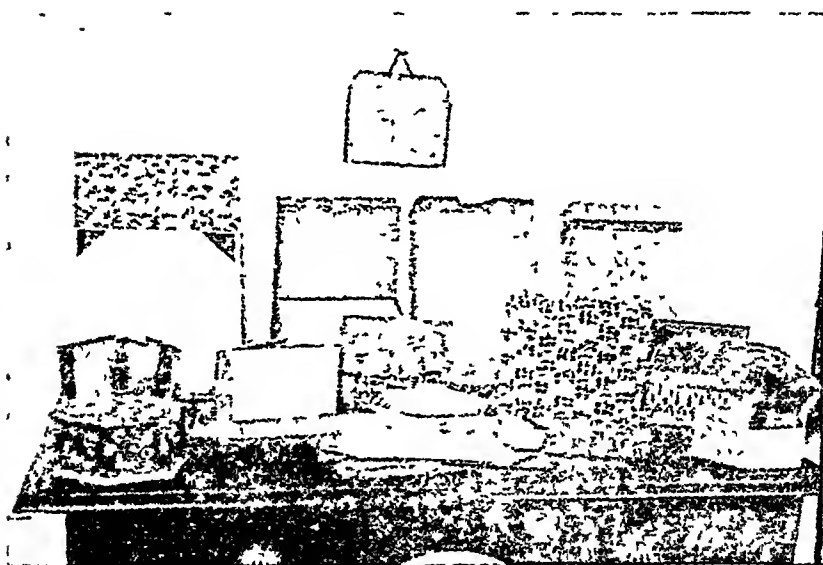
*General Science*

Names of the fibrous local plants—plants used in making paper and cardboard.

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CHAPTER V.  
MODEL SERIES

PLATE No 5



A collection of useful objects made by the pupils



## LESSON I

### SCALE.

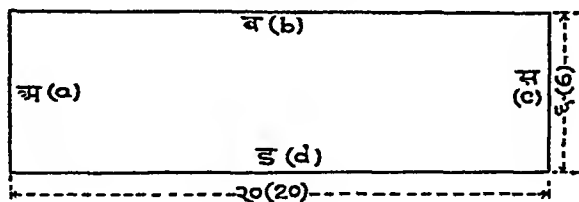
**Materials required.**—Cardboard—10 oz ; size 6×30 cm..

**Tools required.**—Scale; knife; smoother; divider.

**Exercises involved.**—Marking out on cardboard sheet desired lines with the help of a scale; cutting with a knife; smoothing the edges; marking out the inch or centimetre lines.

1. Cut A. (diagram 1.)
2. Cut B at right-angles to A.
3. With the help of a divider, mark out the length.
4. Cut C.
5. With the help of the divider, mark out the breadth.
6. Cut D—control angles.
7. Smooth down the edges.
8. Measure centimetre or inch marks with the scale, and mark with a knife.
9. Make the marks deep, and use pencil or ink to make them distinct.

DIAG No 1



**Demonstration.**—The teacher should give a practical demonstration of the methods of cutting, lining and smoothing the edges.

**NOTES.**—

1. Explain the use of a scale.
2. See that the pupils share tools and themselves distribute the material.

**N.B.** See page 32. Correlated lesson on scale.

## LESSON II

### COUNTING BOARD OR MULTIPLICATION BOARD.

**Materials required.**—Cardboard—10 oz ; mounting paper,

**Tools required.**—Knife; scissors, smoother; divider.

DIAG No 2

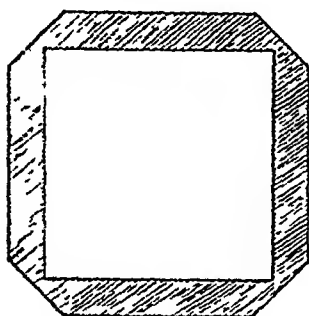


Fig A

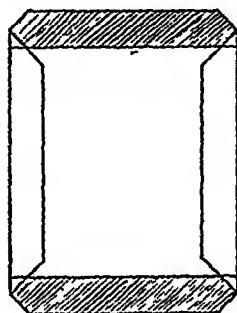


Fig B

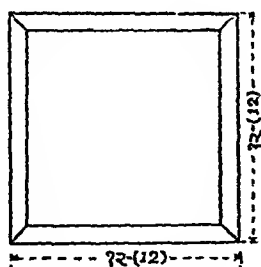


Fig C

**Exercises involved.**—(a) Cut a piece of cardboard  $12 \times 12$  cm. (method as in lesson 1); (b) cut outside mounting paper,  $15 \times 15$  cm. (i.e., 1.5 cm. longer on all sides than the required piece of cardboard), (c) cut mounting paper for the reverse side. 3 or 4 mm. smaller on all sides than the cardboard

#### 2 Mounting

(a) Apply paste to the outside mounting paper; (b) place cardboard in position in the middle of the pasted paper; (c) press cardboard with hand, (see that there is no room for air or air

bubbles); (d) cut the corners of paper diagonally to such a distance from the corners of the cardboard. that the paper fully covers the thickness of the cardboard (Diagram 2—fig. A); (e) fold and fix two opposite sides with the help of finger-nail or smoother; press the over-lapping parts of the corner together (Diagram 2, fig. B); (f) fold the remaining opposite sides and fix. Take great care when mounting the corners, and do the needful with the smoother.

3. Mount the reverse side (Diagram 2—fig. C), seeing that the borders are left equal on all sides. Press under the working board.

4. Make the necessary pencil lines on a sheet of blank paper and paste it on to the board. Later on. when necessary. write the table in figures.

**Theoretical.**—Use the board to teach counting, first from 1 to 10 (ten times) later from 1 to 100, with concrete objects also. When a thorough knowledge of the numbers has been gained, these may be written on the board. Later. the board will be useful for teaching multiplication tables.

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## LESSON III

### ROUTINE BOARD.

Explain the necessity of a routine board

**Materials required.**—Cardboard—12 oz , mono-coloured mounting paper; mounting paper for the reverse side; a sheet of white paper with printed or ruled lines with the names of the days of the week; coloured string or ribbon

**Exercises involved.**—1. Decide the size of board required to fit the white paper.

2 Cut cardboard and mounting materials for front and reverse sides (processes as in lesson 2).

3. Paste and mount (a) Front mounting paper; (b) reverse mounting paper. (c) routine paper

4 Make holes with hole punch

5. Press

6 Run the string or ribbon through the holes and fasten

NB—16 cm  $\times$  20 cm. is a suitable size for the board. with routine paper 9  $\times$  15 cm The border may be decorated (see Lesson XXV).

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## LESSON IV

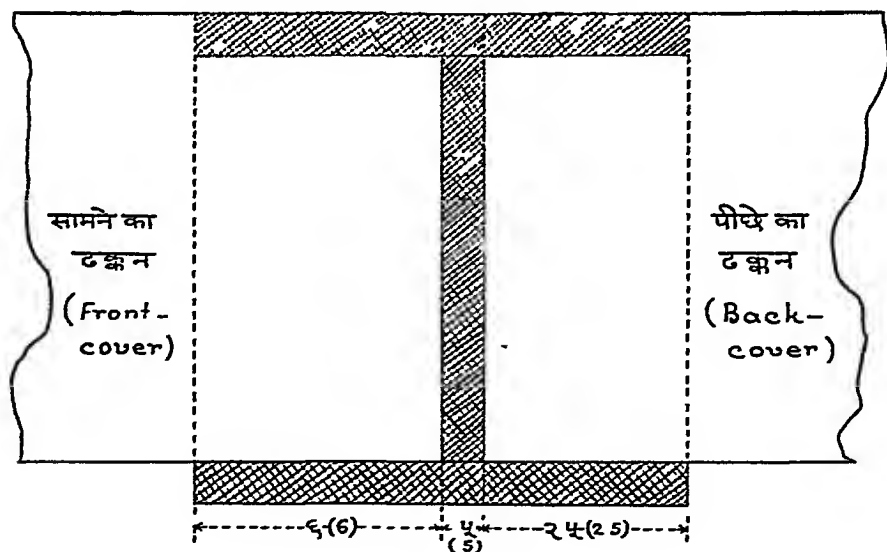
### DRAWING BOOK.

Before starting work, explain why we bind the drawing paper leaves together and plan a lesson thereon.

**Materials required.**—Cardboard (thin): drawing sheets; binding cloth; mounting paper: coloured cotton ribbon or thread to bind the folded drawing sheets. If necessary, fold and cut the drawing paper to the required size.

1 TO MAKE COVERS.—(a) Front cover :—cut a piece of cardboard just a little bigger in size than a page of the paper; (b) back cover :—cut a piece of cardboard of the same size.

DIAG No. 3



2. BINDING —[see page 8(c)] (a) Cut the binding cloth to the required size (diagram 3) leaving 1.5 cm extra on all sides for folding; (b) mark out the spaces for the cover boards; (c) fix them with gum or paste; (d) turn the extended portions and fix them properly; (e) cut inside binding cloth of the same width, but 1 cm

shorter in length, leaving a border of 0.5 cm on each side. Fix it inside.

3. MOUNTING—Cut mounting paper for inside and outside covers. paste it.

4. BINDING.—(a) Place the folded pages in their proper place between the covers; (b) make two holes and bind with twisted cotton thread or ribbon.

5. Press.

Size of the above model—18×26 cm

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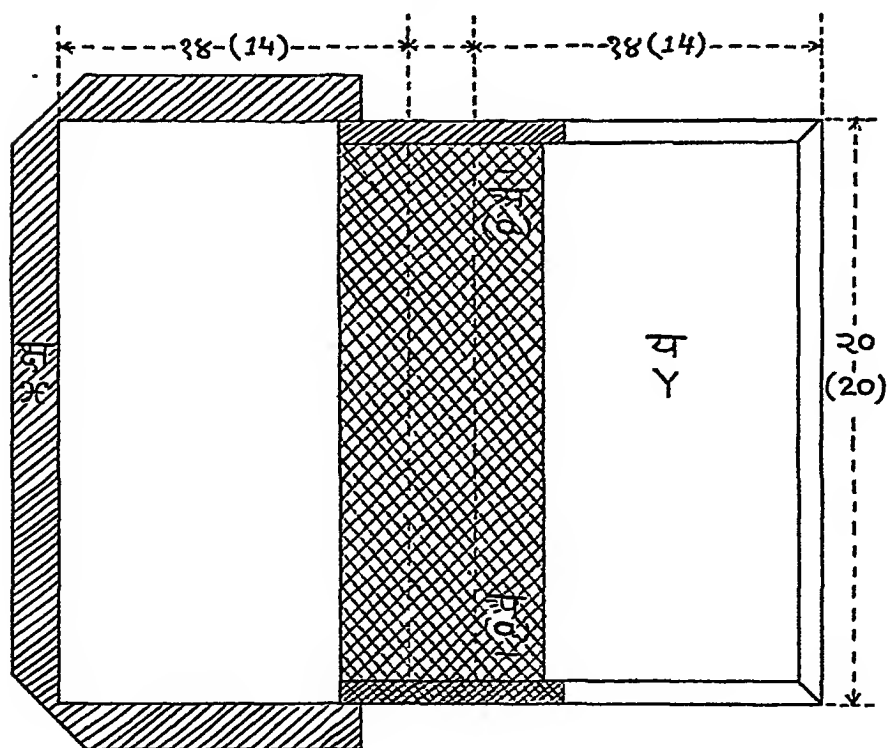
## LESSON V

### LOOSE COVER FOR BOOK

Describe the utility of a loose cover which can be used on any book of standard size and thus keep it clean.

**Materials required.**—Cardboard (thin); binding cloth (patterned for the outside and thin dark-coloured for the inside); mounting paper coloured by the pupils themselves for the outside of covers (see pp. 10-12); light coloured paper for inside mounting; elastic tape.

DIAG No 4



**Exercises involved.**—1. Cut the cover boards—size 14×20 cm.

2 TO JOIN WITH BINDING CLOTH ON INSIDE AND OUTSIDE.—(a) For the outside cut the cloth 7 cm. broad and 23 cm. long; (b) for the inside, cut cloth of the same breadth but about 1 cm. shorter in length than the length of the model (c) fix the outside binding—following the method used in the previous model; (d) fix the inside binding (Diagram 4); (e) smooth the inner binding

3 MOUNTING—FOR OUTSIDE COVERS—(a) Mark out position of the mounting paper, leaving a protruding margin of say 2 cm. of the binding cloth; (b) cut and fix mount papers (Diagram 3).

4. TO MOUNT INSIDE COVERS—Cut and fix as in previous model

5 TO FIX ELASTIC TAPE INSIDE BACK OF COVER—(a) With the knife, make two short cuts—(a a) (Diagram 4); (b) fix the tape double inside over-folded (insert at (a) lower end on the inside of the cover, from the outside, bring tape inside round bottom end of cover; carry tape the length of cover inside, double round upper end of cover and insert through slot (a) to inside of cover; tie the ends at the middle).

6. Press the model, with covers opened.

*Alternative methods of fixing the book.*—(a) Cloth corners may be made (Diagram 9). (b) Inside pockets may be made (Diagram 6).

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## LESSON VI

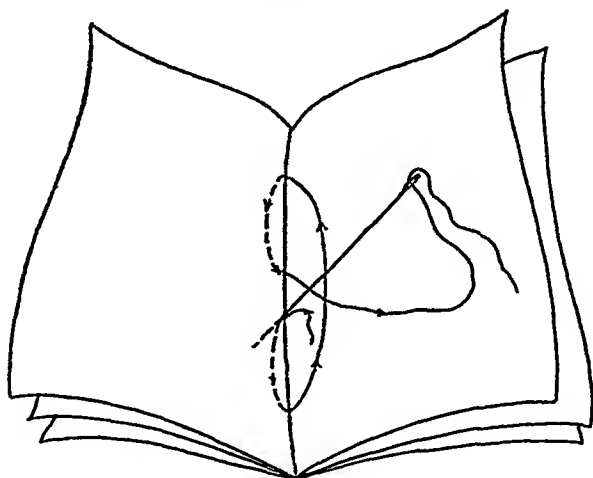
### ORDINARY EXERCISE BOOK

**Materials required.**—Blank writing paper; (for instance, double foolscap, about 32 pages); thick paper for covers (hand-made paper may be used); thread (for stitching).

**Exercises involved.**—1. Fold the paper sheets (in the case of double foolscap, three times).

2. Place the sheets between the cover.

DIAG No 5



3. **STITCHING.**—(a) Insert needle at crease on inside about 1.5 cm. below centre; (b) carry the needle, on the outside, to 1.5 cm. from bottom edge of book; (c) pierce, and bring the thread to inside of book, (d) carry thread on inside to 1.5 cm. from the upper end. (e) pierce and carry thread on outside to 1.5 cm. above middle; (f) pierce and tie ends (the long thread must lie between the two shorter ends)—(Diagram 5).

4. **CUTTING.**—(a) Cut breadthwise at right-angles to side; (b) fix out the breadth and mark, (c) cut lengthwise.

If a mono-coloured paper is used, decorate the cover (see Lesson XXV).

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## LESSON VII

### NOTE BOOK WITH PENCIL HOLDER

Describe the utility of having a note book, and how to keep notes of daily activities

DIAG No 6

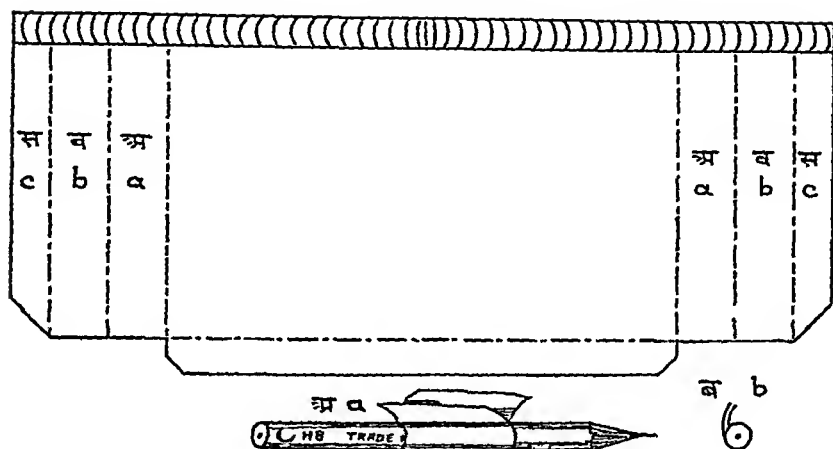


Fig A

DIAG No 7

Fig B

**Materials required.**—Cardboard—8 oz., binding cloth (for binding shoulder and pencil-holder); outside mounting paper, inside mounting paper; writing paper

**Exercises involved.**—1 To MAKE COVERS—Prepare covers size  $9 \times 14$  cm.; binding cloth 5 cm wide, with 1.5 cm between the covers (Diagram 4)

2. Place note-paper between inside mounting paper; stitch together as in model (Diagram 5)—size  $8 \times 13$  cm.

3 To MAKE POCKET.—(a) Cut a piece of cloth about  $11 \times 22$  cm; (b) fold and paste outer edges on one long side only; (c) fold in at (a) and (a), (d) cut from (c) to (a) at both ends, leaving a flap of the same width as folds (a), (b) and (c); (e) fold outwards—(b) and (b), (f) fold inwards (c) and (c) (diagram

6); (g) cut inside mounting paper; (f) paste at edges (c) and (c) and also at flap, with wrong side of the paper towards the pocket.

N. B. When completed, the full length of the pocket should be about 1 cm. less than the length of the cover board.

PRESS.

4. TO MAKE PENCIL HOLDER.—(a) Cut a piece of binding about  $5 \times 7$  cm.; (b) roll it over a pencil (Diagram 7—Fig. A) and stitch the ends (Diagram 7—Fig. B); (c) paste in centre of outside cover crease; (d) paste inside cover to outside cover.

PRESS.

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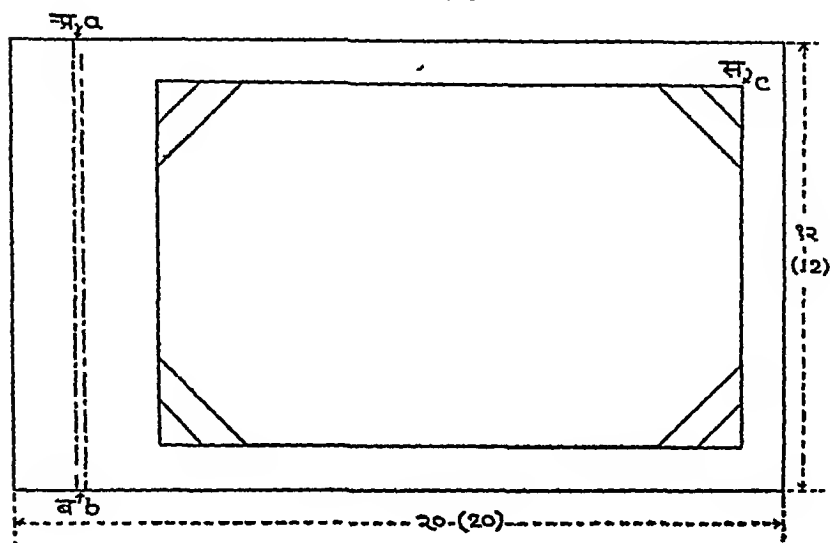
LESSON VIII

PICTURE ALBUM

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2269

**Materials required.**—Thick strong paper, of suitable colour (for pages), thick hand-made paper (for cover), coloured ribbon.

DIAG No 8



**Exercises involved.**

1 Fold in half, individually, six sheets of the required size, and place one upon another.

2 Mark outside lines dotted (a) (b)

3 With smoother, make these lines clear on each pair of sheets

4. Place leaves between cover sheets. Mark places for holes and punch them

5 Cut the album to size (12×20 cm).

6 To cut corner lines for fixing pictures

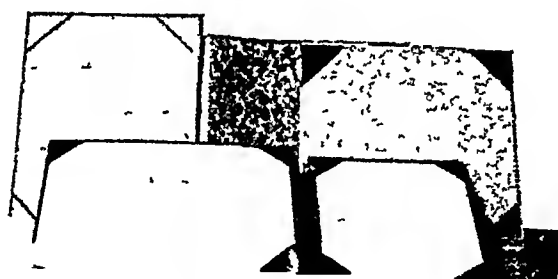
(a) With the help of a card, mark the required outline on the first page, (b) mark out lines for slots (Diagram 8—Fig. C); (c)

mark similar lines on every page; (*d*) cut slots on each page, individually; (*e*) erase the pencil lines.

7. Decorate the cover.

OTHER KINDS OF ALBUM.—For photograph albums of different sizes with mounted covers, see extra models. It is not always necessary to cut slots for corners—the photographs may be fixed with paste.

PLATE No 6



Various kinds of writing boards and blotting pads .

## LESSON IX

### WRITING BOARD AND BLOTTING PAD

**Materials required.**—Cardboard—16 oz ; inside mounting paper (for upper side), coloured mounting (for reverse side); thick paper for corners.

**Exercises involved.**—1. Cut a piece of cardboard  $25 \times 34$  cm : cut paper of the required size for upper and reverse sides

2. Mount the upper side.

3. TO MAKE CORNERS —(a) Cut four rectangular pieces of cloth  $6 \times 12$  cm ; (b) cut four pieces of strong paper to the shape of

DIAG No 9

Fig A

Fig B

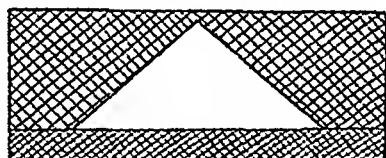
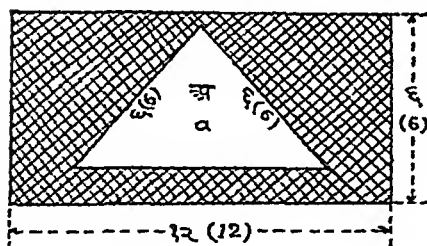


Fig D



Fig E

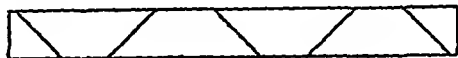


Fig C

right-angled triangles, with two sides of equal length (6 cm); (c) to make corners firm, paste triangular pieces on the pieces of cloth (diagram 9, figs. A and B), (d) paste the corners on to the mounted cardboard. In order to preserve the shape, when finished. insert into the corners rectangular pieces of thin cardboard. These should be removed only when the blotting paper is inserted. (These pieces should be free from paste).

4. Mount the reverse side, leaving a margin of 0.5 cm. on all sides.

5. Press.


*Other types of writing boards and blotting pads.*

Suggestions for variations of this model may be obtained from similar articles available in the market.

The teacher may make his own choice. (See also plate no. 6).

N.B.—An alternative more economical method of making corners may be used by students who are further advanced. Diagram 9, figs. C, D and E shows how to cut the corner pieces from a strip of cloth and how to paste on to the cardboard. These corners may also be lined with paper as above

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## LESSON X

### PORTFOLIO FOR WRITING MATERIALS.

**Materials required.**—Cardboard, cloth (for binding shoulder and corners); ribbon (15 to 20 cm. long);

**Exercises involved.**—1. Cut covers—size 20×25 cm

2. To MAKE CORNERS —(a) Cut four pieces of cloth 3.5×8 cm.; (b) fasten to corners of covers (Diagram 10, Fig. A, B and C) (edges to meet on the inside); (c) smooth down well. (For alternative method of making corners see Diagram 9, figs: C, D and E.).

3 To BIND THE SHOULDER —(a) Cut cloth for shoulders 7 cm. wide and fasten (Diagram 4); (b) place covers flat on working board and make the shoulders double by lining inside; (c) smooth with care.

4. To MOUNT COVER —(a) Mark out position of shoulder on both covers (2 cm.); (b) place a piece of mounting paper in position on one cover, (c) fold corners of mounting paper (Diagram 10, A and B), repeat these processes for the other cover; (e) placing the two covers together, cut outside corners of mounting paper (to ensure uniformity); (f) paste the mounting paper on to cover.

5. To INSERT RIBBON.—(a) Mark out slot (in middle of cover. about 1.5 cm. from the outer edge); (b) mark with knife; (c) cut slots from outside; (d) cut ribbon in half, insert in slot, and paste on the wrong side. (e) repeat the processes with the remaining cover

6. Prepare pocket for one side (Diagram 6).

When mounting inside of second cover. either place corners for blotting pad or fix folding flaps of strong paper to keep contents in position.

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DIAC No 10 Fig A

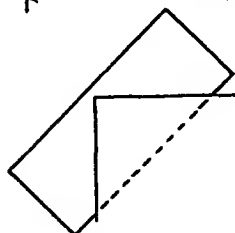
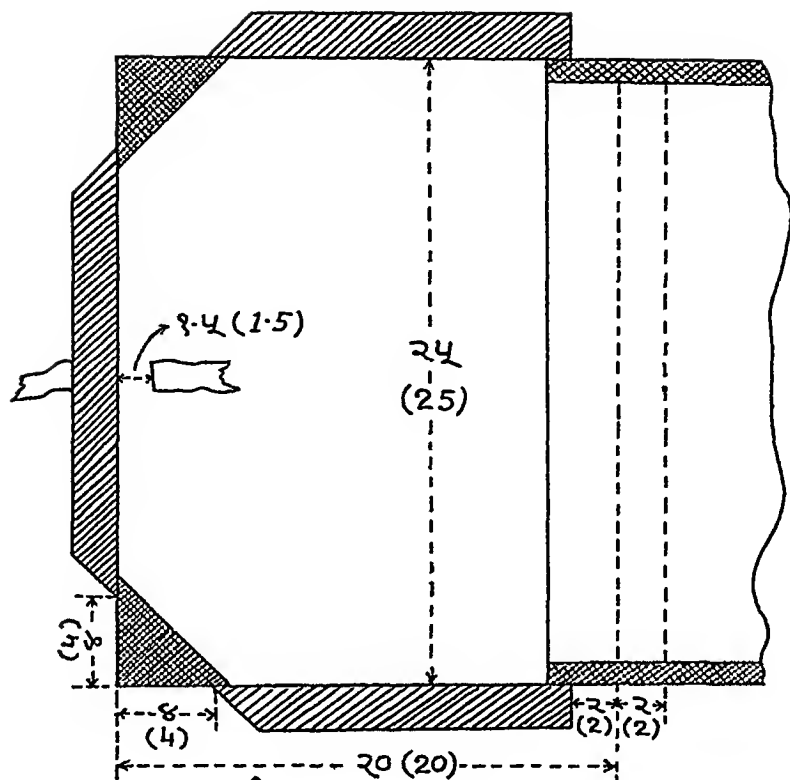


Fig B

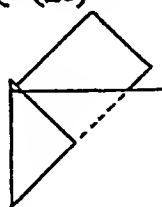


Fig C

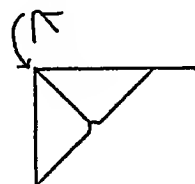


Fig D

PLATE No 7



Simple open box

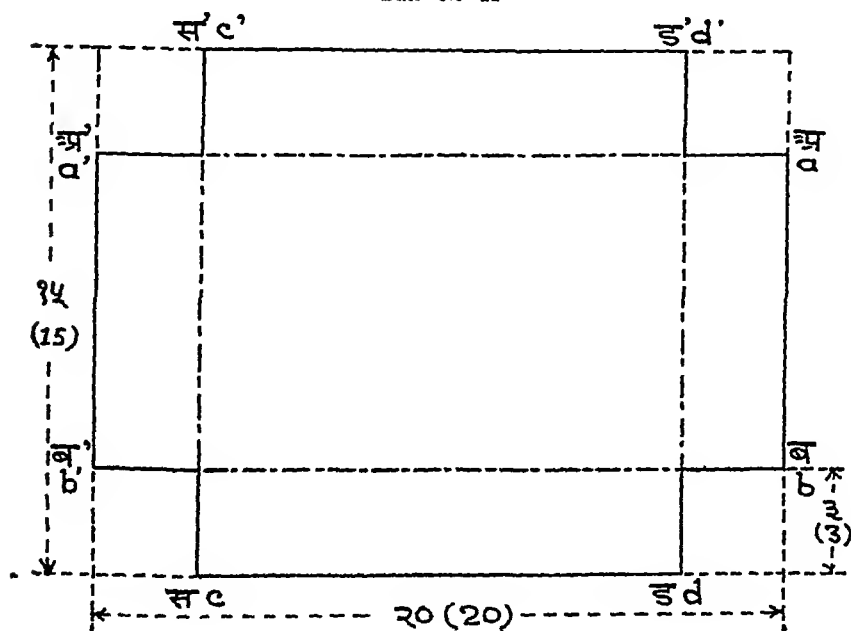
LESSON XI

SIMPLE OPEN BOX.

**Materials required.**—Cardboard (medium thickness), thin dark cloth for fixing corners; outside mounting paper; inside mounting paper.

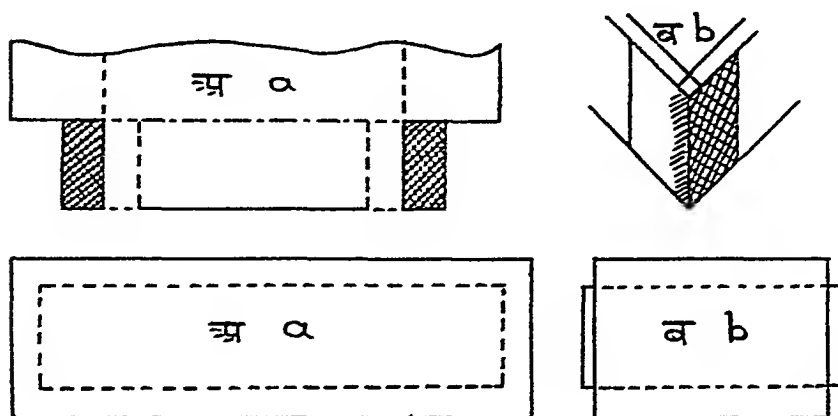
**Exercises involved.**—1—To MAKE BOX —(a) Cut a piece of cardboard  $15 \times 20$  cm. (Diagram 11); (b) make lines aa, bb, cc, dd,,

DIAG No 11



(c) cut through with knife to half the thickness of the cardboard; (d) cut off square corners: (e) cut eight pieces of cloth 2 or 3 cm. wide—length to be the same as the height of the box; (f) paste cloth on to corners first outside, then inside (Diagram 12, Figs. A & B).

DIAG No 12



DIAG No 13

2. MOUNTING.—(a) Cut two pieces of mounting paper 1 cm longer on all sides than the long side of the box; (b) mount the long sides, cut top and bottom corners with scissors (Diagram 14—Figs.

DIAG No 14

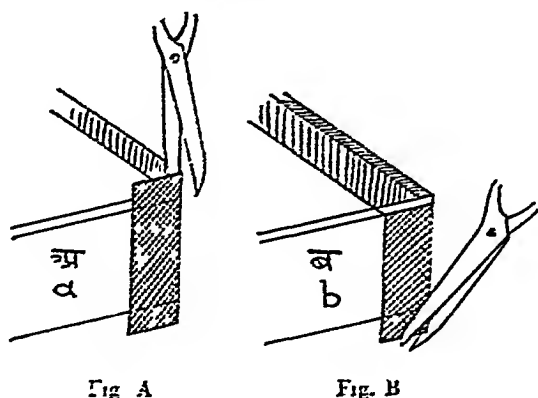


Fig. A

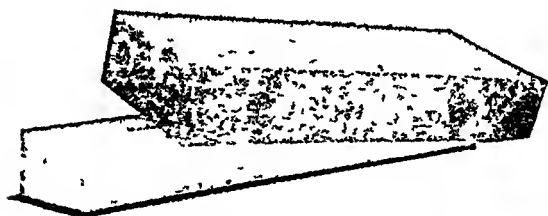
Fig. B

A & B): (c) cut two pieces of mounting paper, breadth as in diagram 13. Fig. A, length as inside measurement of short side of box: (d) mount the sides; (e) mount bottom (outside).

3 INSIDE MOUNTING.—(a) Cut a piece of paper at least 0.5 cm. larger on all sides than the inside measurements of bottom of box; (b) mount inside bottom, seeing that edges of mounting paper are well fixed to side of box. (c) cut mounting paper for long sides—2 cm. longer than inside measurements of box, but 3 or 4 mm shorter than inside height of box; (d) mount long sides, (e) cut mounting paper for short sides—length as inside measurement of box—height as inside mounting paper of long side. While fixing, see that inner borders are the same on all sides.

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PLATE NO 8



Rectangular box with stand and cover

## LESSON XII

## RECTANGULAR BOX WITH STAND AND COVER.

**Materials required.**—Cardboard (medium); cloth (for binding corners and extended bottom); mounting paper (for cover); light coloured mounting paper (for box); inside mounting paper.

**Exercises involved.**—1 To MAKE BOX.—(a) Cut and make box (Diagram 15); (b) fasten the corners on outside only (Diagram 14.)

2. (a) Cut cardboard bottom, 6 to 7 mm. longer on all sides than the bottom of the box; (b) fasten to box; (c) press. (This should be done in such a way that the pressing is uniform—either place an even weight in the box or place the box upside down on a piece of wood and then press).

3. Mount bottom corners of box together with extended edge (Diagram 16—Fig. A).

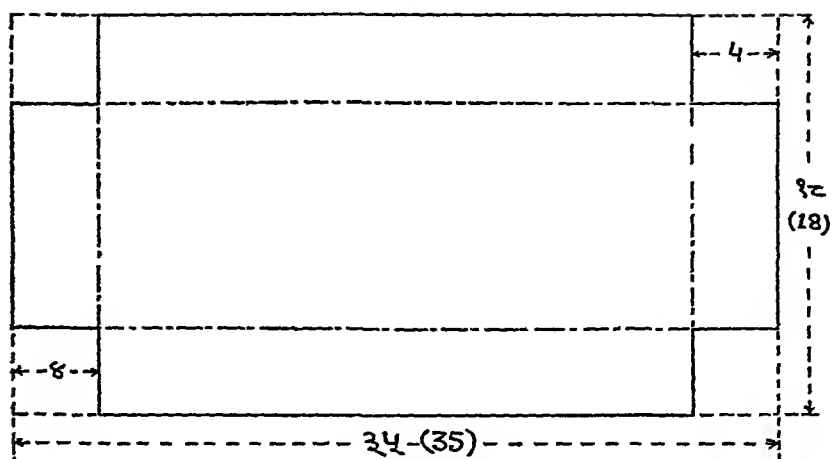
4. Mount box, inside and outside. sides and bottom. Leave a border of cloth mounting at bottom edge of inside.

5. To MAKE COVER.—(a) On a large piece of cardboard, measure corner 4.5 cm. square (height of box. plus 0.5 cm. margin). (b) place top of box on cardboard, with one corner abutting on inside corner of small square (Diagram 16—Fig. B). Leave a small margin which must be determined by the thickness of the mounting material for inside and outside of cover. Usually, 2 mm. margin is sufficient.

To MOUNT AND MAKE COVER.—Repeat processes used in making box.

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DIAC No 15



DIAC No 16

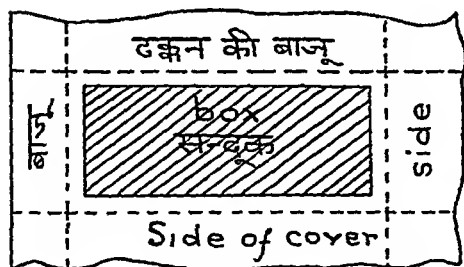


Fig B

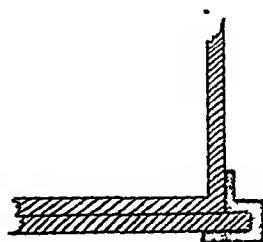


Fig A

## LESSON XIII

### SQUARE BOX WITH STAND AND EXTENDED LID.

**Materials required.**—Cardboard (medium). cloth (for binding corners. extended bottom and hinge); mounting paper (for outside), mounting paper (for inside). ordinary paper (for mounting underneath side of stand).

**Exercises involved.**—1. Cut out box (Diagram 17) and fasten corners.

2. Cut out stand and fasten (diagram 16, fig. A).

3. Cut out two pieces for lid—outside as size of bottom stand, inside slightly smaller than inside measurements of box, to ensure free movement after fixing.

4. Mount outside and inside pieces of lid on one side only.

5. (a) Cut a piece of strong cloth for hinge—length as inside measurement of box—breadth 4 cm. Fold lengthwise and cut ends sloping slightly inwards (edges shorter) to avoid showing colour at edges.

(b) Apply paste to inside of both sides of lid and place hinge cloth in position on inside of lid. with 2 cm. placed over edge. Place outside of lid in position (Diagram 18 (a) ). Press. (The hinge for a large box should be made of double cloth, one piece to be fixed inside and one piece outside the box).

6. Mount extended edge of stand with cloth (Diagram. 16, fig. A).

7. Mount the box (outside).

8. Mount the box (inside) on three sides.

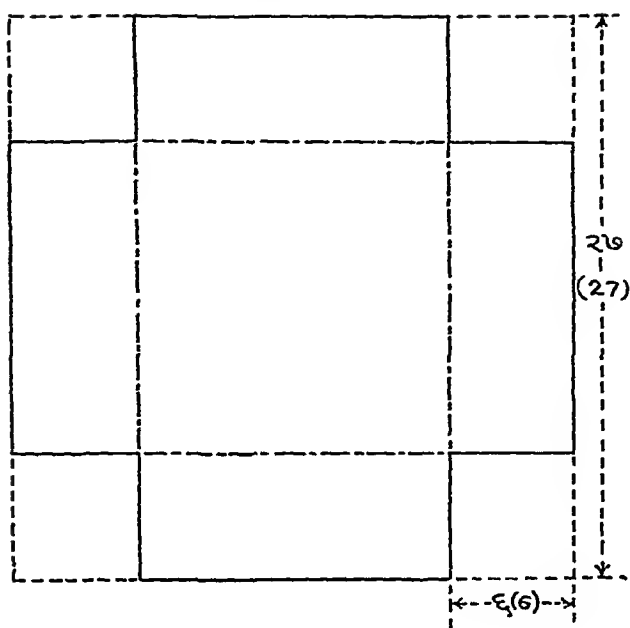
9. Fasten the hinge on unmounted side (Diagram 18 (b) ).

10. Mount the remaining side.

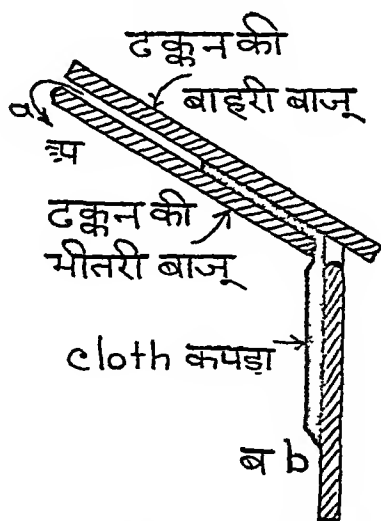
11. Press the box.

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DIAG No 17



DIAG No 18



Square box with stand



## LESSON XIV

### PICTURE RIMMING.

**Materials required.**—Cardboard (medium); glass; picture; cloth; small brass ring.

(If a glass-cutter is not available, the glass cutting may be done in the school, otherwise the glass may be cut beforehand to the required size. Take the size of the picture-board and get a piece of cardboard cut to that size and send it to the glass-cutter).

Glass and card-board mount must be of exactly the same size.

**Exercises involved.**—1. Place photo or picture on board.

2. Clean glass and place over picture.

3. Fasten together with clip (bull-dog type). If clips are not available, simply bind together lengthwise with twine.

4. To FRAME SIDES WITH CLOTH.—(a) Frame long sides (Diagram 19, (a) and (b) ); (b) frame short sides (Diagram 20, (a) and (b) ).

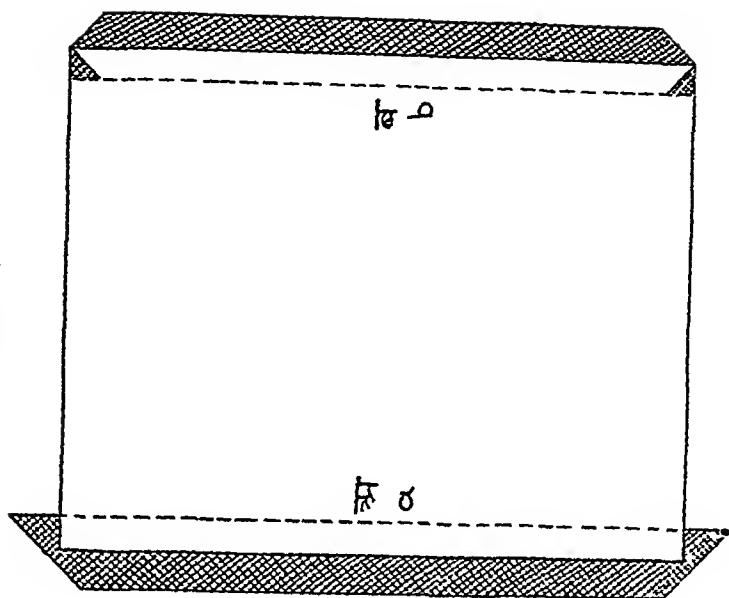
5. To FASTEN RING.—(a) Insert a piece of tape through ring and fasten both ends on to back of picture, (b) cover cloth ends with a piece of strong paper.

The ring should be firmly fixed. In the case of a big and heavy picture, cut a slot in the cardboard mount, pass a piece of tape through ring and insert two ends in slot. Fix ends separately on the inside.

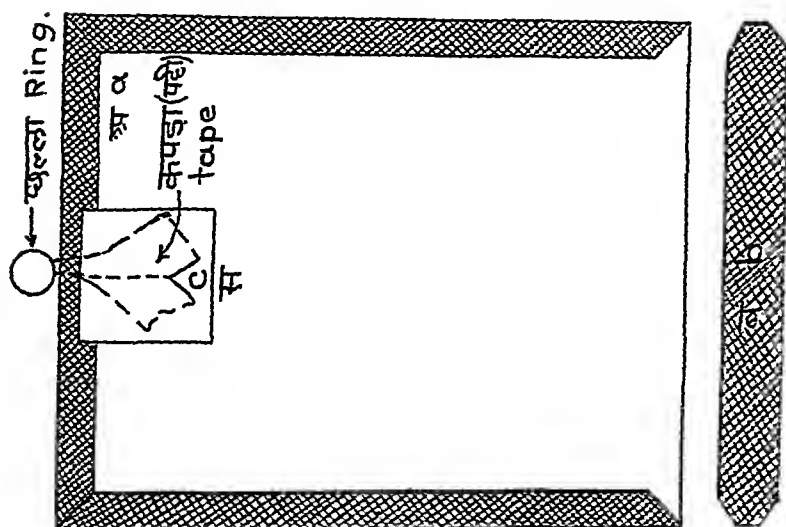
Make sure that the framing cloth harmonises with the picture.

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Dia. No 19



Dia. No 20



Picture Rimming

## LESSON XV

### WALL PORTFOLIO

**Materials required.**—Cardboard; cloth; mounting paper; ordinary oiled paper for mounting inside and back; (oiled paper is used in this model to withstand the strain of friction); coloured cotton ribbon.

**Exercises involved**—1. Cut the cardboard piece (Diagram 21—Figs. A and B)—middle line being half-cut.

2. Fold along middle line; re-open and mount (a) and (b) on the inside, using one piece of paper.

3. CLOTH BINDING.—(a) Cut two pieces of cloth, 7×13 cm. (Diagram 22, Fig A), (b) fold lengthwise in the middle; (c) cut edges diagonally (Diagram 22—Fig. A); (d) fold edges outwards; (e) fold cardboard and fix cloth between edges (Diagram 22—Fig. B), the narrow end of cloth being at crease; (d) paste strip of the same kinds of cloth outside bottom crease (Diagram 22—fig. C).

4. Mount the front (outside of pocket),—upper and lower part separately.

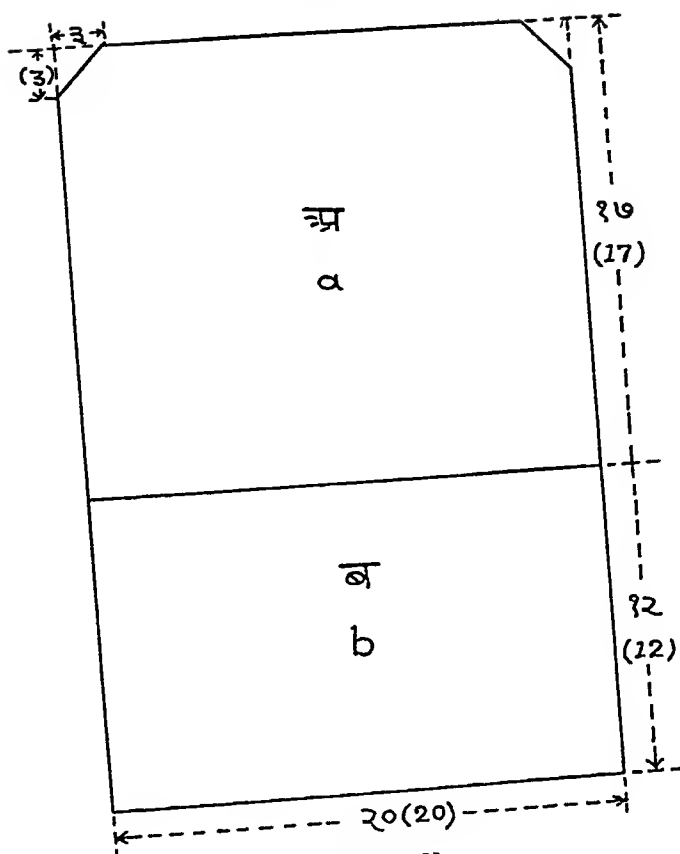
5. Mount the back.

6. Make holes. Press.

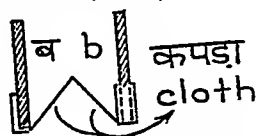
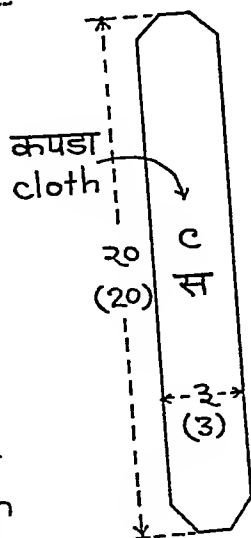
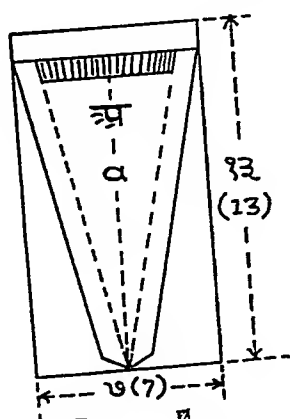
7. Thread ribbon.

Mono-coloured paper may be used for mounting For designing see Lesson 25.

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DIAC No 22



## LESSON XVI

### PORTFOLIO WITH FLAP

**Materials required.**—Cardboard (thin); outside mounting paper; inside mounting paper, cloth for binding.

**Exercises involved.**—1. Cut cardboard pieces (*a*), (*b*) (*c*), (*d*) and (*e*), (Diagram 23—Fig. A).

2. Cut cloth shoulders, 6 cm. broad

3. Fasten the shoulders on outside between (*a*) and (*b*), and (*b*) and (*c*)

4. (*a*) Cut snicks in shoulder cloth (Diagram 23,—Fig. B), (*b*) fasten cardboard pieces (*e*) and (*d*) to shoulder cloth, outside; (*c*) paste cloth (*f*) (Fig. B) on to cardboard (*b*) (Fig. A) on outside, (*d*) fold and paste flaps (*g*) and (*h*); (*e*) repeat the whole process on the inside, leave usual margin, again and thus making double cloth shoulders

5. Mount both outside and inside For method of turning outside mounting paper of flaps, see Diagram 23—Fig. A (*d*)

6. Press.

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DIAG. No 23 Fig A

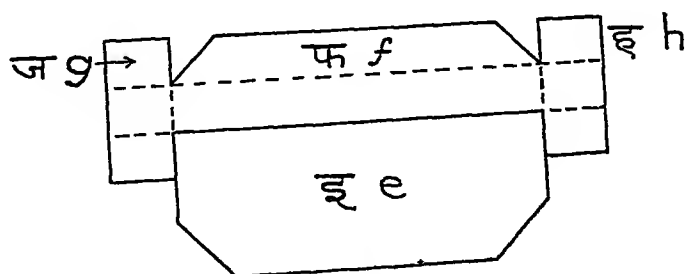
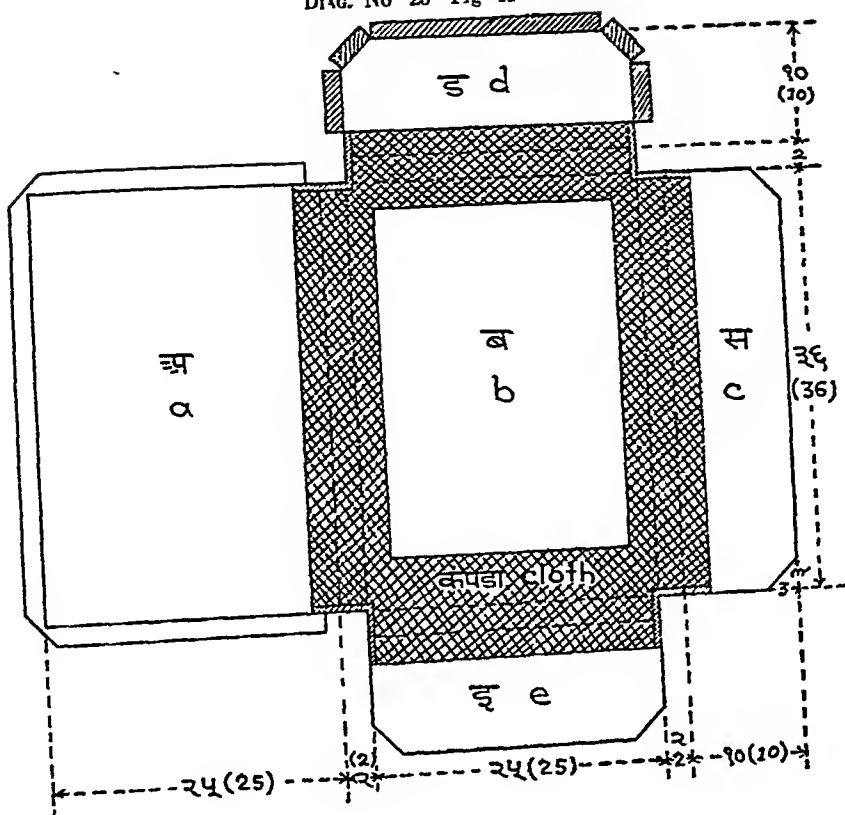


Fig. B

Portfolio with flat

## LESSON XVII

### CLOSED PORTFOLIO

**Materials required.**—Cardboard (thin); cloth (for sides and shoulders); mounting paper; inside mounting paper.

**Exercises involved.**—1. Cut cardboard pieces, (*a*), (*b*) and (*c*) (Diagram 24—Fig. A).

2. Mount (*a*) and (*b*)—inside of portfolio.

3. To MAKE SIDES OF CLOTH.—(*a*) Cut a piece of cloth, breadth 6 cm. length 1 cm. (margin)+20 cm (breadth)+30 cm. (length)+1 cm. (margin) (Diagram 24—Fig. B); (*b*) fold the cloth in half, lengthwise (*a*) to (*a*) inside out (Diagram 24—Fig. C); (*c*) on outside, fold the cloth lengthwise (*bb*) and (*cc*); (*d*) open out the cloth and leave fold slack; (*e*) fold crosswise to obtain length of sides at (*a*) and (*b*) (Fig. C); (*f*) fold the cloth lengthwise along middle crease and cut corners to width of pasting margin (Diagram 25); (*g*) unfold the cloth and fasten on outside of cardboard pieces (*a*) and (*b*) (Diagram 24—Fig. A); (*h*) fold over and fix short sides.

4. Turn in margin of cloth (Diagram 25, (*a*)), and fix.

5. Fasten flap (*c*) (Diagram 24—Fig. A), process of shouldering and mounting as in lesson 16 (Diagram 23—Fig. B).

6. To MOUNT THE PORTFOLIO —(*a*) Mount the portfolio itself; (*b*) bind edges of flap with a strip of cloth or paper as desired; (*c*) mount flap, inside and outside.

7. Press.

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DIAC No 24

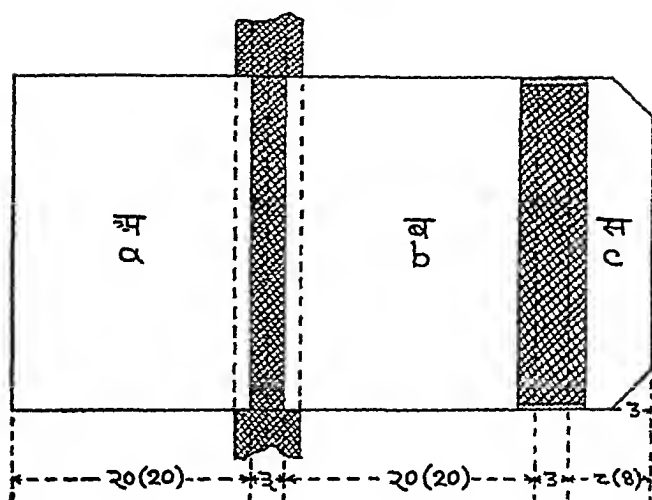


Fig. B

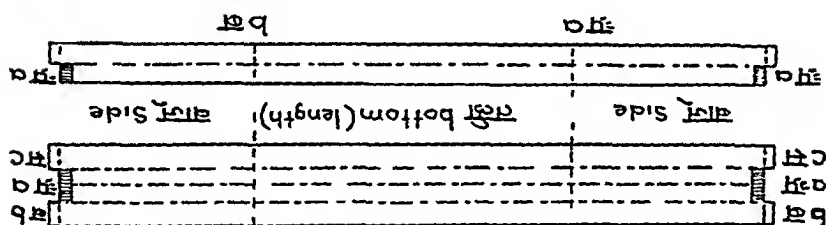
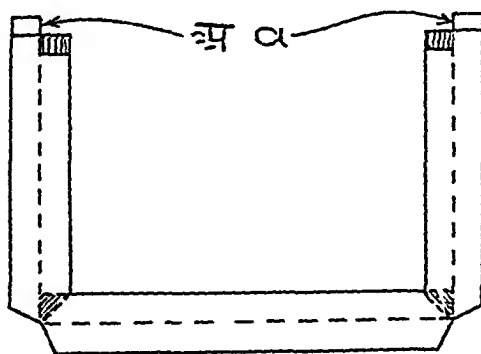


Fig C

DIAC No 25



Closed portfolio



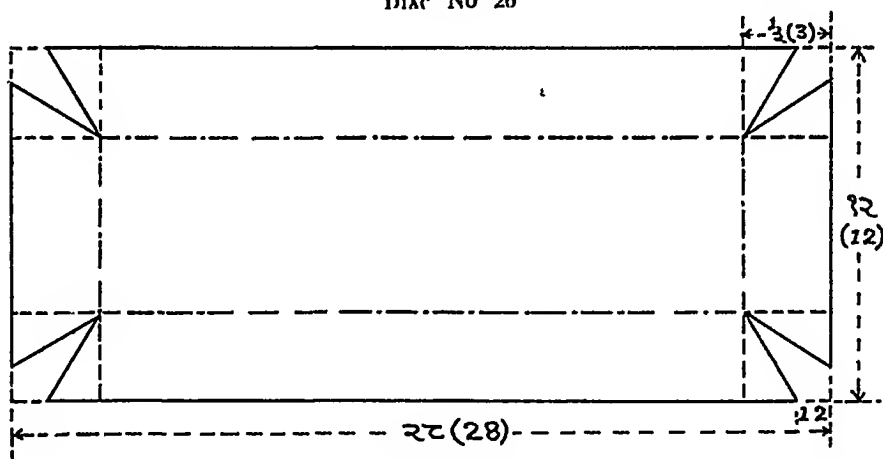
Pencil tray

## LESSON XVIII

### PENCIL TRAY (WITH SLOPING SIDES)

**Materials required.**—Cardboard (medium thickness); cloth (for binding corners); mounting paper (dark); dark coloured paper or cloth (for mounting inside and bottom outside).

DIAG No 26



Pencil tray

- Exercises involved.**—1. Cut a piece of cardboard— $12 \times 28$  cm.  
 2. Draw lines (Diagram 26).  
 3. Cut away the kite-shaped corners.  
 4. Fold up the sides.  
 5. Fasten the corners.  
 6. Mount outside sides of tray (When cutting and folding see that sides are straight and well formed). Mount the bottom (outside).  
 7. Mount the inside

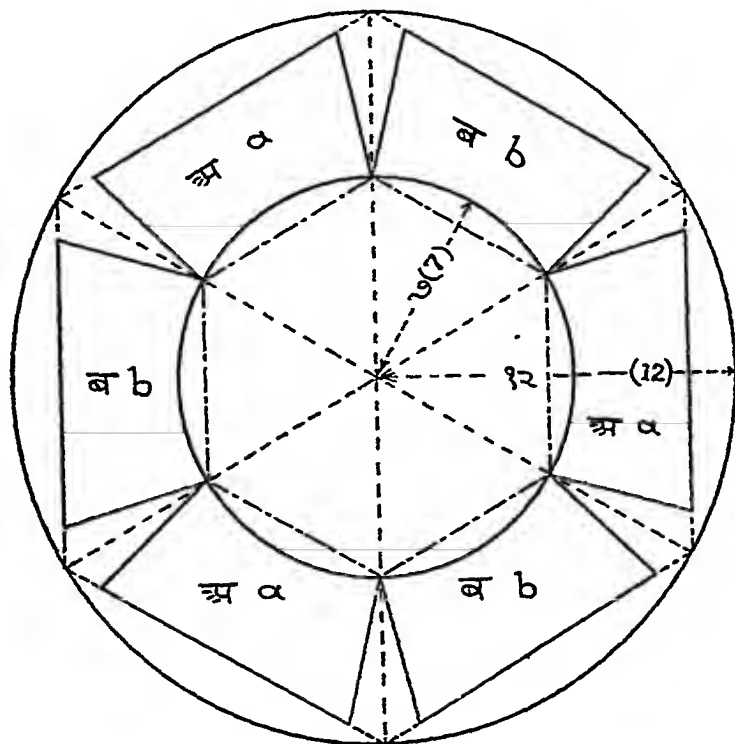
**NOTE :—**Explain the advantage of sloping sides over perpendicular sides (for purposes of storing).

## LESSON XIX

### HEXAGONAL TRAY (SLOPING SIDES)

**Materials required.**—Cardboard (medium); binding cloth. mounting paper, inside mounting paper; paper for outside bottom

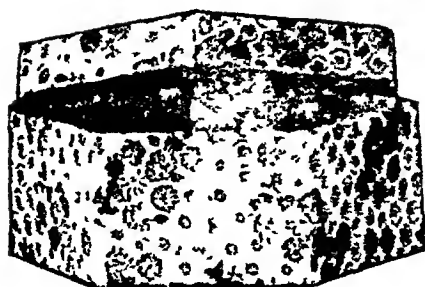
DIAG No 27



Hexagonal Tray

**Exercises involved.**—1 (a) Draw big circle on a piece of cardboard (Diagram 27); (b) divide the circle into six equal parts (the length of each chord to be equal to the length of the radius). (c) draw the six diameters; (d) draw the smaller circle. (e) mark out six kite-shaped corners and complete the drawing (Diagram 27)

2. Cut the cardboard, fold and fasten corners
3. Mount the outside sides (a), (a), (a) as long sides and (b), (b), (b) as short sides of four-sided box (Diagrams 11 and 12).
4. Mount the bottom (outside).
5. Mount the inside.



Hexagonal Box with cover  
(Khadi mounting)

## LESSON XX

### HEXAGONAL BOX WITH COVER

**Materials required.**—Cardboard (medium); outside mounting paper; inside mounting paper, mounting paper for outside bottom.

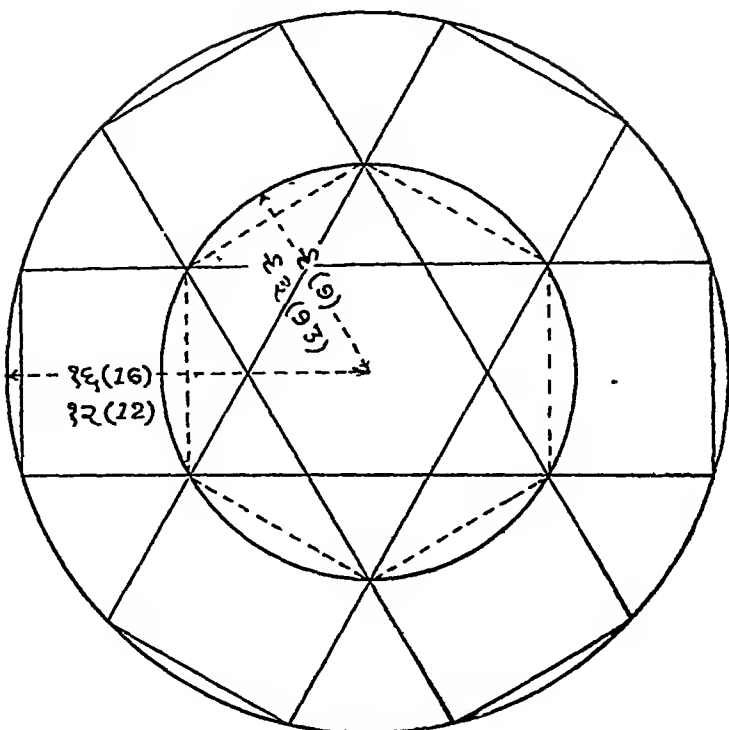
**Exercises involved.**—1. Draw (a) big circle, radius 16 cm ; (b) small circle, radius 9 cm ; (c) complete drawing (Diagram 28).

2 Cut the cardboard; fold and fasten corners.

3. Mount outside with paper or cloth, and inside with paper, as in the previous model.

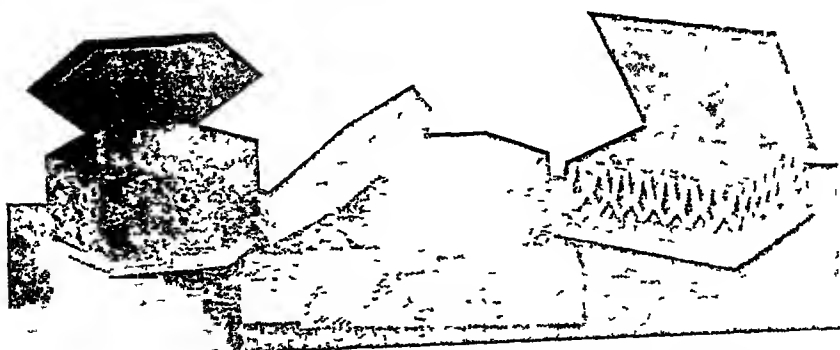
4 Make cover, using same method as for box, the radii being 12 cm. and 9.3 cm. respectively. If thick mounting is used, the measurement of 9.3 cm. must be slightly increased.

DIAG No 28



Hexagonal Box

PLATE No 11  
Some models



- |  |   |
|--|---|
| 1 Hexagon box, hinged lid, silk mounting | 3 Sliding box                                 |
| 2 Hexagonal box with cover               | 4 Square box with hinged lid (khadi mounting) |

## LESSON XXI

### LAMP TRAY (round).

**Materials required.**—Cardboard (medium); mounting paper; ordinary coloured paper (for mounting bottom).

**Exercises involved.**—1. Cut a piece of cardboard (Diagram 29). The easiest way is to use a circle knife. If this is not available, use the divider with one arm flattened and sharpened, and draw the line deep. Then use point of knife or scissors to cut.

2. Cut mounting paper for the top side, radius about 1 cm greater than that of cardboard (Diagram 29 (b) ).

3. Cut mounting paper for bottom, radius 5 mm less than that of cardboard (Diagram 29 (c) ).

4. MOUNTING.—(a) Put gum or paste on the top mounting paper and fix cardboard on to it; (b) snick margin all round to width of 1 cm. (Diagram 29 (d) ); (c) turn and fix on other side; (d) smooth the work.

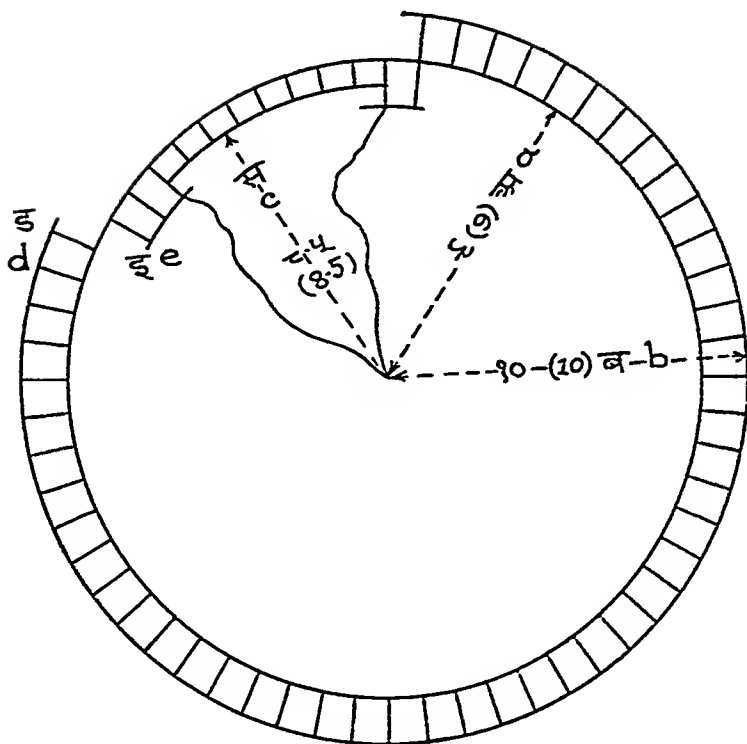
5. Mount the bottom.

6. Press.

For decoration see Lesson 25.

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DIAG No 20



Lamp trav

## LESSON XXII

### ROUND TRAY.

**Materials required.**—Cardboard (6 oz.) (for the body), 10 or 12 oz. (for the bottom); mounting paper (for outside and inside); mounting paper (for the bottom).

**Exercises involved.**—1 Cut a piece of 6 oz. cardboard, width 8 cm., length sufficient to go three times round any round object such as a bottle, having a diameter of 8 cm.

2. Cut out the bottom (two pieces—one of 10 oz. and one of 6 oz. cardboard). This can be done with a circle knife or a divider with one point flattened and sharpened (diameter as that of round object). Mark circular lines on both sides and cut out later with scissors.

3. Roll the long strip three times round object. fix with paste, and leave to dry.

4. Fix bottom piece (10 oz. cardboard) inside body.

5. Mount the body outside with paper 11 cm in width, allowing 15 cm margin at each side. Snick the extended edges, turn and fasten

6 Mount the interior of the body and the outside of the bottom.

7. Mount the extra bottom piece and fix in.

---

## LESSON XXIII

### BOOK-BINDING

(Exercise book—say 80 pages).

**Materials required.**—Cardboard (8 oz.); binding cloth: exterior mounting, interior mounting, writing paper; twine or strong thread, small pieces of thin cloth

**Exercises involved.**—1. Fold paper sheets to required size and place in position.

2 (a) Mark out points on shoulders for stitching (Diagram 30—Fig. A.); (b) with knife, pierce holes for stitching

3. Cut two sheets for inside mounting and fasten to the papers which will form the front and back leaves of the book

4. TO STITCH THE BOOK TOGETHER.—(a) Fold paper together in sets of not more than two sheets (8 pages): (b) stitch first set of sheets (Diagram 30—Fig. A) stitches to be firm over cloth strips (dotted lines show long stitch running inside crease); (c) place second set of sheets in position, stitch similarly, but in reverse direction without breaking thread (Diagram 30.—Fig. B) beginning from 1 to 2, 2 to 3 etc.

5. (a) Fasten the cloth strips to inner mountings firmly and tightly, leaving no margin for looseness, (b) apply paste to shoulder (back of book). Press (to ensure firmness in binding).

6. Cut cardboard pieces for covers.

7. Fasten them to both sides of book, leaving a margin of 1 or 2 mm from edge of shoulder. Press

8. Fasten binding cloth to shoulder, turn protruding ends and fix on inside. Press and leave to dry.

9. Cut the front edge of leaves

10. Mount the covers

11. Cut top and bottom edges of leaves. Press.

*Note.*—When small children are binding such a book, both covers may be mounted with a single piece of paper or cloth, if so desired.



DIAG No 30

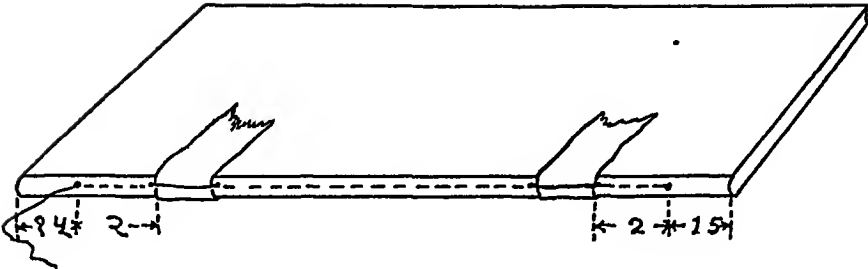


Fig A

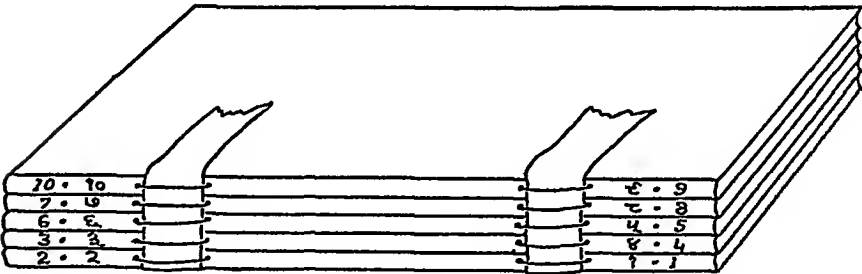
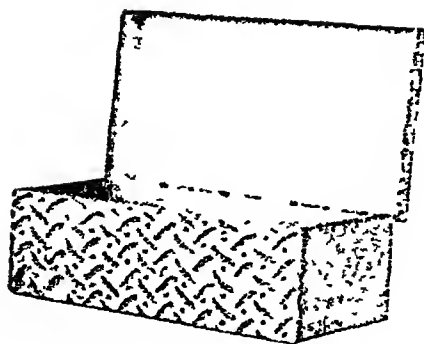


Fig. B

Binding Book



Box hinged lid with neck (khadi mounting)

## LESSON XXIV

### OTHER TECHNIQUES

(Box, hinged lid, with neck)

**Materials required.**—Cardboard (very thick). mounting materials

**Exercises involved.**—1 (a) Cut top and bottom pieces each  $20 \times 30$  cm.. (b) cut two long sides.  $10 \times 20$  cm plus twice the thickness of the cardboard used in 1 and 3 (Diagram 31)

2 From the length of each side, cut a piece 2.5 cm in width leaving 7.5 cm as height of box. These pieces will be the side pieces of the lid

In the preparation of this model the processes for making the box and the lid are exactly similar. These similar processes should always be performed at the same time in order to ensure conformity of shape and size. It should therefore be understood that instructions given, apply to both top and bottom

3. (a) Paste long sides to outside edges of bottom (b) paste short sides to outside edge of bottom then edge to be flush with outer edge of long side (Diagram 32. (a) and (b) )

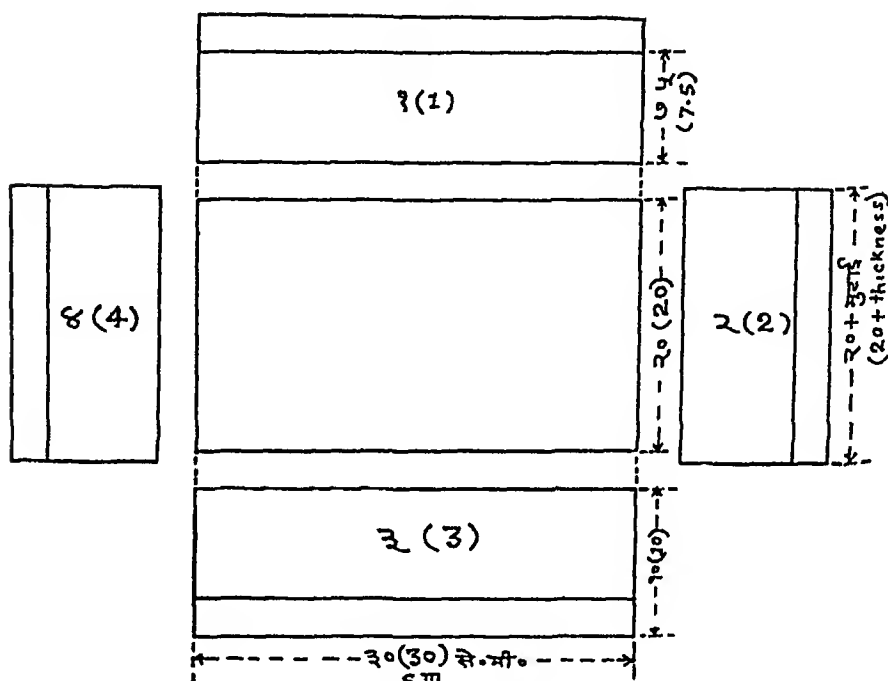
4. Finish neatly. see angles are right sand-papering extended edges and any unevenness. Fix corners and bottom either with paper or with binding cloth

5 TO MAKE EXTENDED WALL OF CARTON —(a) Cut a strip of carton, length as inside measurements of box, width 6 mm greater than inside height of box. (b) mount one side entirely, one side to depth of 1 cm.; (c) fold accurately to get corners, and fit in box, the two

ends meeting exactly. The extended part, say 6 mm, will form the neck. The lid will be fixed on this.

6 Mount inside bottom of box to carton, or make cotton pad for bottom and fix.

DIAG No. 31



DIAG No 32

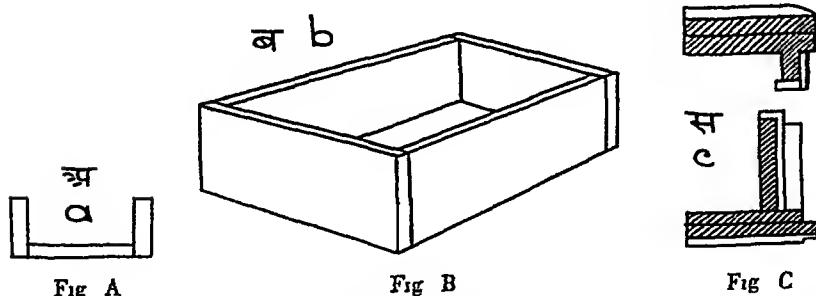


Fig A

Fig B

Fig C

Box, hinged lid with neck

7. On long side, make a cloth hinge between lid and box. Fix inside lid, and between the box and the carton neck

8 Mount exterior of box and lid in one piece or in single pieces as desired.

9. Fix a short tape to lid and box at a distance of about 2 cm. from the hinge. This will prevent the lid from falling back when opened.

NOTE.—A box of this type may be mounted with paper, cloth or leather.

Diagram 31. (c) shows method of making large strong box on similar lines. In this model the neck piece is of thick cardboard and an extra layer of cardboard is affixed to lid and bottom

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## LESSON XXV

### DECORATION OF A MODEL MOUNTED WITH MONO-COLOURED PAPER.

The aesthetic, material and educational value of models which have been mounted with mono-coloured paper may be increased by decoration. Decoration with paper will add nothing to the cost of the model, since small pieces of waste paper may be used. Suitable models for decoration are the routine board (Lesson 3), wall portfolio (Lesson 15), front cover of drawing book (Lesson 4), picture album (Lesson 8) etc.

Models such as trays should not be decorated with paper.

DIAG No 33

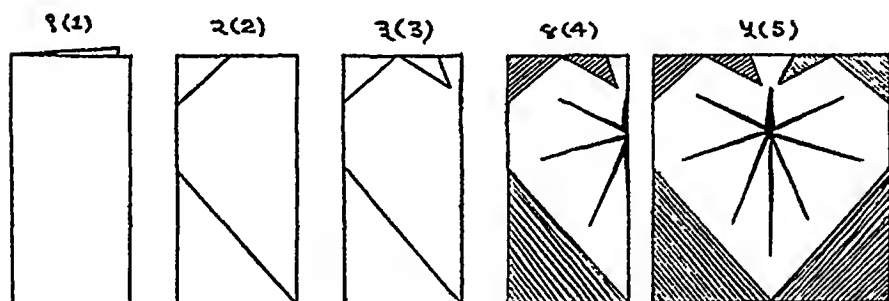


Fig. A

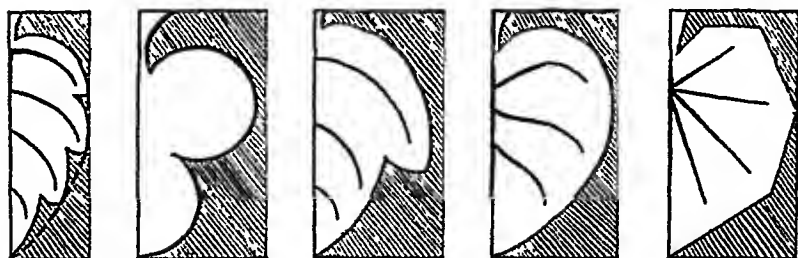


Fig B

*Composition*—Great care should be taken with the colour composition, and proper attention should be paid to the relative size of the model and the designs. The designs should be wholesome and harmonious. See Diagram 33,—Figs. A & B for method of folding and cutting a few suitable designs.

Water-colour designs may also be made. This will give the pupils a further opportunity of learning colour painting.

## OTHER MODELS

1 *Hexagonal box with neck.*—It may be made in the same way as rectangular box (Lesson 24).

PLATE No 13



Round box with neck - silk mounting

2 *Round box with neck.*—At the end of the course round boxes with neck, as shown in the illustration (Plate No 13) may be made with either paper or cloth mounting. The picture shows a box mounted with hand-made silk. A box of this type calls for great accuracy and efficient handling of tools and materials. Therefore it may be used to test the abilities of the pupils. At the time of mounting, a soft pad should be inserted at the bottom of the box, and covered with khadi or hand-made silk.

Thin leather, either plain or modelled and designed, may also be used to cover a box. It will be a fancy article but advanced pupils should learn how to handle leather on cardboard.

3. Circular box for bottle or cartons may also be made in class.

The size of such extra models should be determined from case to case.

## EXTRA MODELS

When the elementary techniques of cardboard modelling described in the systematic course in this book have been mastered it should be quite easy to make any useful object of cardboard. There

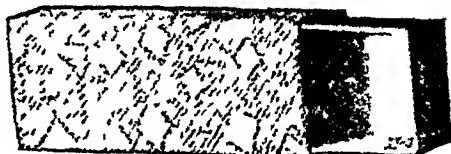
fore, pictures of some extra models are given here :—

- 1 Sliding box
- 2 Fancy albums—for pictures
- 3 Handy box portfolio—to carry papers and books.
4. Table stand
- 5 Portable carrier with double lids
- 6 Artist Portfolio.
- 7 Some other models .

- (a) Portable paper carrier  
(b) Box portfolio  
(c) Table tray

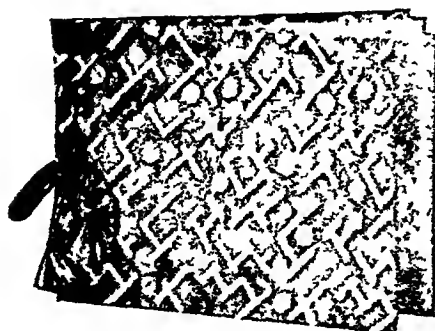
PLATE No 14

This box is useful and may be used by the children themselves to keep their pencils, brushes, tahn and similar objects



1 Sliding box

PLATE No 15



2 Fancy Album—Silk mounting

Such a beautiful album when made by one's own hand, proves to be very economical

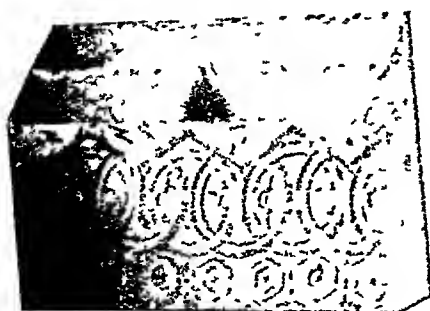
PLATE No 16

There are two pins to lock the box. When opened, the cover provides a support as writing pad



3 Handy box portfolio—khadi mounting

PLATE No 17



4 Table stand—khadi mounting

It is useful to preserve letter-paper and envelopes from damp and may be used for valuable documents—free from insects and exposure

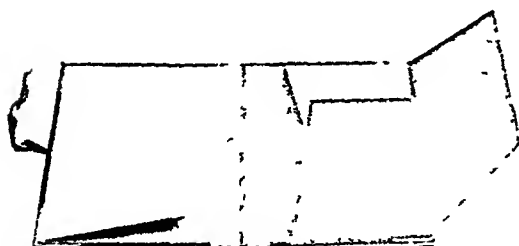
It is durable handy and also useful to place writing material—cards and letter

PLATE No 18



5 Portable carrier with double lids—khadi mounting

PLATE No 19

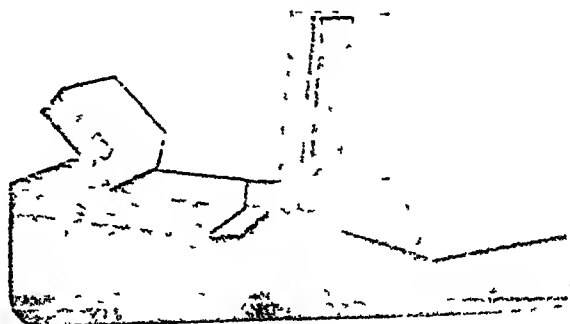


6 Artist portfolio

It has a pocket on one side and traps on the other

PLATE No 20

- 7 Some other models  
 (a) Portable paper carrier  
 (b) Box portfolio  
 (c) Table tray





## APPENDIX A

### PREPARATORY MODEL SERIES OF PAPER AND CARTON

1. Square tray.
  2. Bag
  3. Square envelope.
  4. Propeller.
  5. Envelope (Rectangular).
  6. Oblong tray with sloping sides
  7. Cubic box (with lid)
  8. Hexagonal tray.
  9. Octagonal tray
  10. Circular shade.
  11. Kites.
-

## LESSON I

### SQUARE TRAY

Distribute square-shaped paper (Diagram 34). Let the pupil measure all sides and comment thereon

**CONSTRUCTION** :—(a) Make lines by folding (Diagram 31). (b) cut along the lines; (c) fold on the dotted lines; (d) put paste on flaps and fix inside

**Exercises**.—1. Are the sides of the paper equal to each other ?

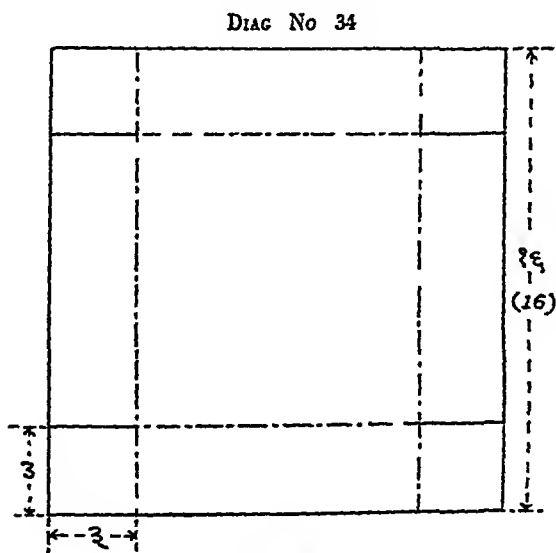
2 What was the size of the paper ?

3. What is the size of the tray ?

4 What is the difference in measurement in the side and the height of the tray ?

5. Is there any difference in form between the tray and each corner flap ?

6 Are the flaps equal to each other ?



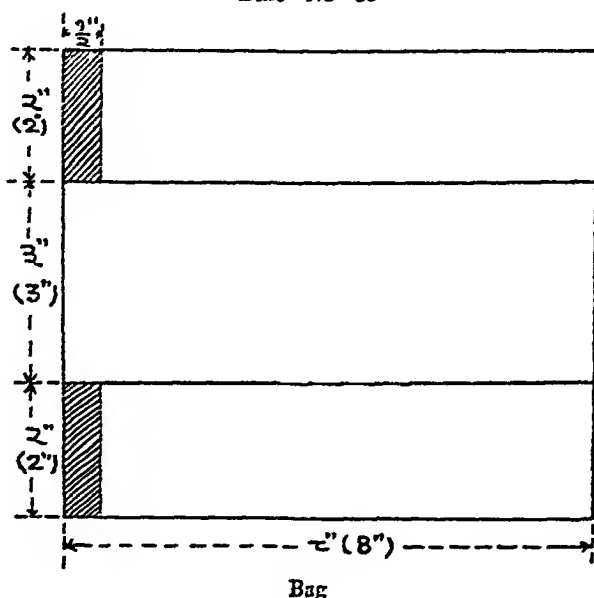
## LESSON II

### BAG

Paper—size as per Diagram 35.

(a) Cut away the waste (shaded portion) with scissors; (b) fold along inside lines: (c) fold up bottom; (d) fasten with paste.

DIAG No 35



- Exercises.**—1 What is the measurement of the paper?  
 2. What is the sum of the measurements of all the edges?  
 3. What is the difference in form between the bag and the tray.

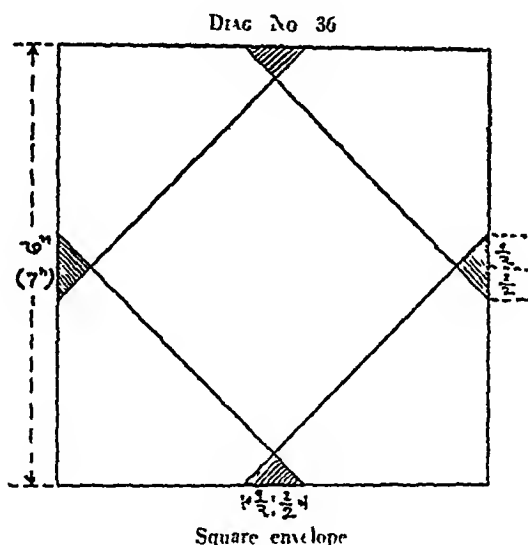
## LESSON III

### SQUARE ENVELOPE

(a) Cut away the waste (Diagram 36): (b) fold two opposite corners into centre; (c) fold and paste down the third corner. (d) apply paste on the fourth corner. (e) let it dry

**Exercises.**—1 What is the length of one side?

2 Are all the sides equal? Introduce the word “square.”



3. What is the total length of four sides (perimeter)?

4 What is the shape of the pieces of waste paper? How many sides have they? Introduce the word, triangle.

5. Measure the sides of the triangle

6 What is the total length of all the sides of the envelope?

N.B. Envelopes of different sizes should be distributed amongst the pupils and they should be asked to make an envelope of the same size as the envelope given to them (see Diagram 36)

## LESSON IV

### PROPELLER

Distribute to the children square paper-sheets and pieces of strong cardboard—one inch square.

(a) Fold the paper diagonally and find out the middle point (centre); (b) paste the square piece of cardboard in the centre firmly and cut the diagonals up to the edge of the cardboard; (c) turn corners (a), (b), (c) and (d) into centre and fasten them with paste, (d) press and pin through the centre into the end of a stick or piece of bamboo.

*Exercises.*—1 Find out the length of one side of the square.

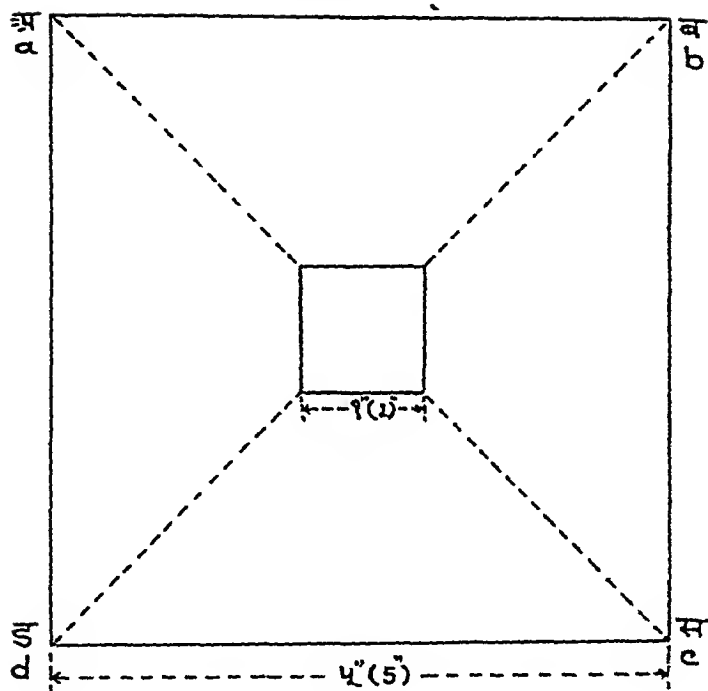
2. Let the children test the angles with a set-square and find that they are equal. Explain that these angles are called right-angles

3. How many right-angles are there in a square?

N.B. Suspend the the propellor in various positions to show the motion of the air.

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DIAG No 37



Propeller

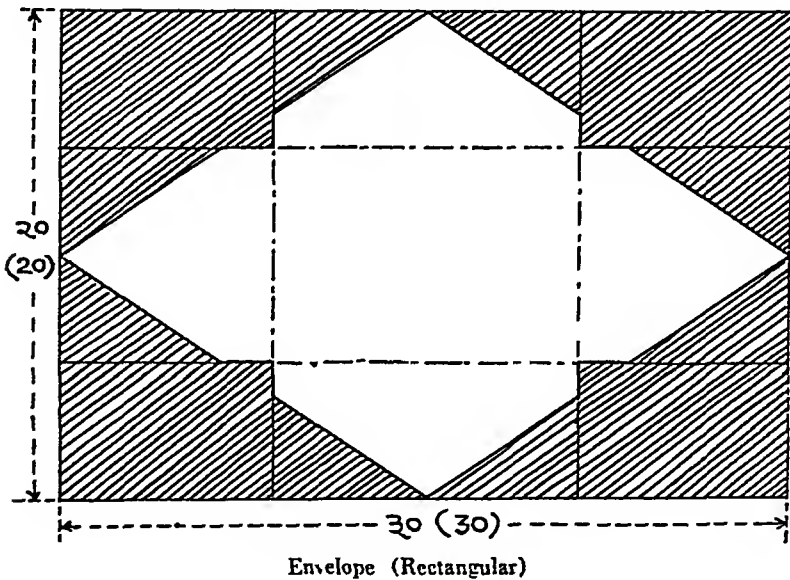


## LESSON V

### ENVELOPE (RECTANGULAR)

(a) Fold along lines, (b) cut away the waste; (c) fold the opposite short flaps into centre; (e) fold one long flap to centre and fix on short flaps; (d) apply paste to the fourth flap and leave it to dry

DIAG No 38



**Exercises.**—Explain the difference between this envelope and that made in Lesson 3.

Establish the fact that the present one is rectangular and not square.

## LESSON VI

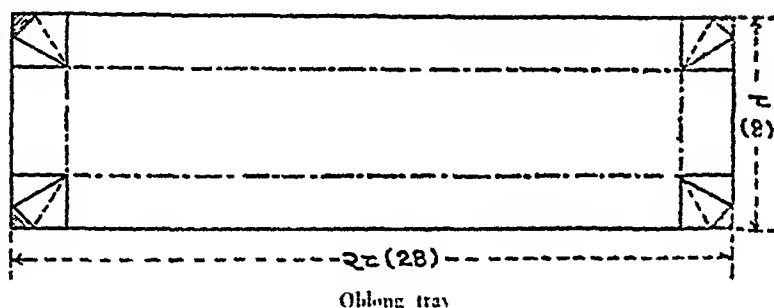
### OBLONG TRAY—WITH SLOPING SIDES

Introduce centimetric

(a) Fold along lines, (b) cut away the waste: (c) fasten the flaps on the outside

**Exercises.**—Measure the sides of the given paper. Make a statement. What is its shape?

Disc No 39



What is the difference between the length and the breadth?

**NOTE:** Collect the models and put one inside another and draw the notice of the children to the fact that objects of this kind with sloping sides, can be packed within a small compass. Invite examples: Thalis, katoris (cups), glasses, karat (frying pan) etc.

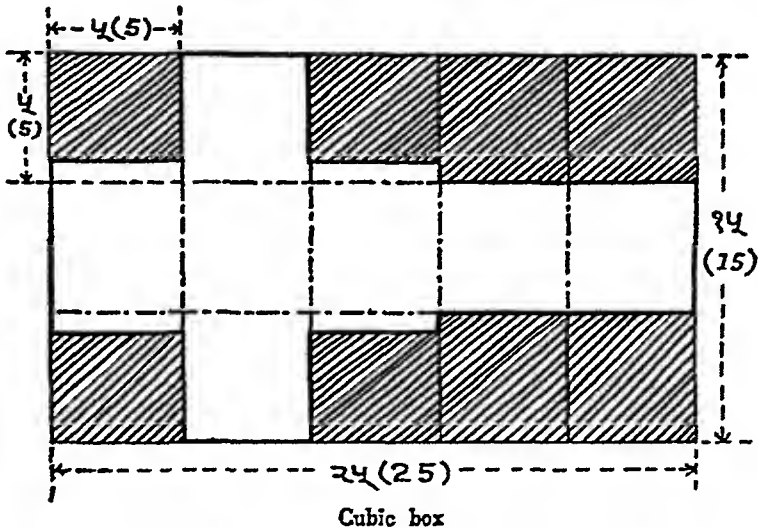


## LESSON VII

### CUBIC BOX OF CARTON WITH LID

(a) Fold the carton as indicated. creasing lines well; (b) cut away the waste; (c) fold into box and fasten the corner-flaps on the outside.

DIAC No 40



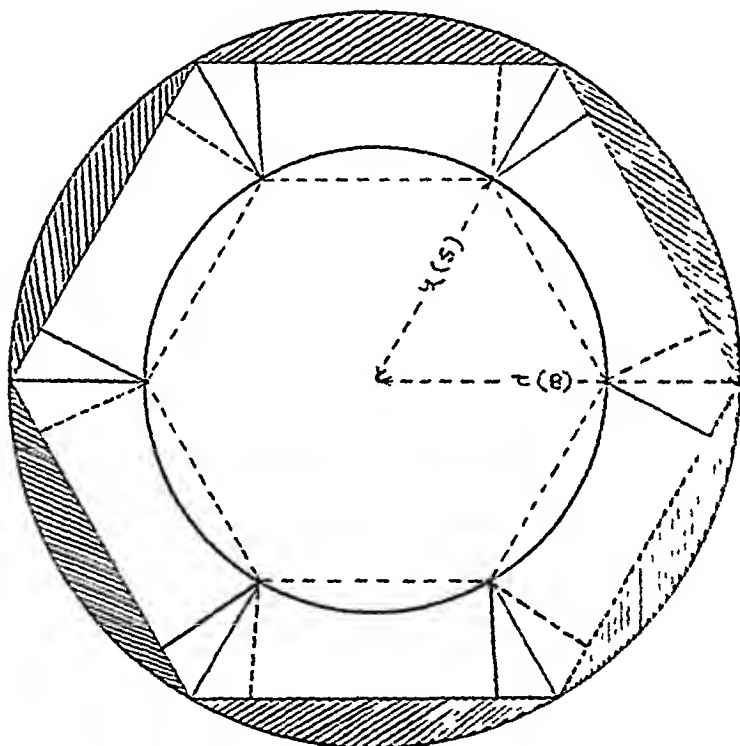
**Exercises.**—Measure the box. Are all the sides equal? How many sides has the box?

## LESSON VIII

### HEXAGONAL TRAY OF CARTON

(a) Draw the circles, six diameters, six corner- and the line- in the corner (Diagram 41): (b) cut away the waste and cut the

DIAG No 41



Hexagonal tray

corner lines. (c) fold and fasten on outside upto dotted corner lines; (d) cut the extended corners

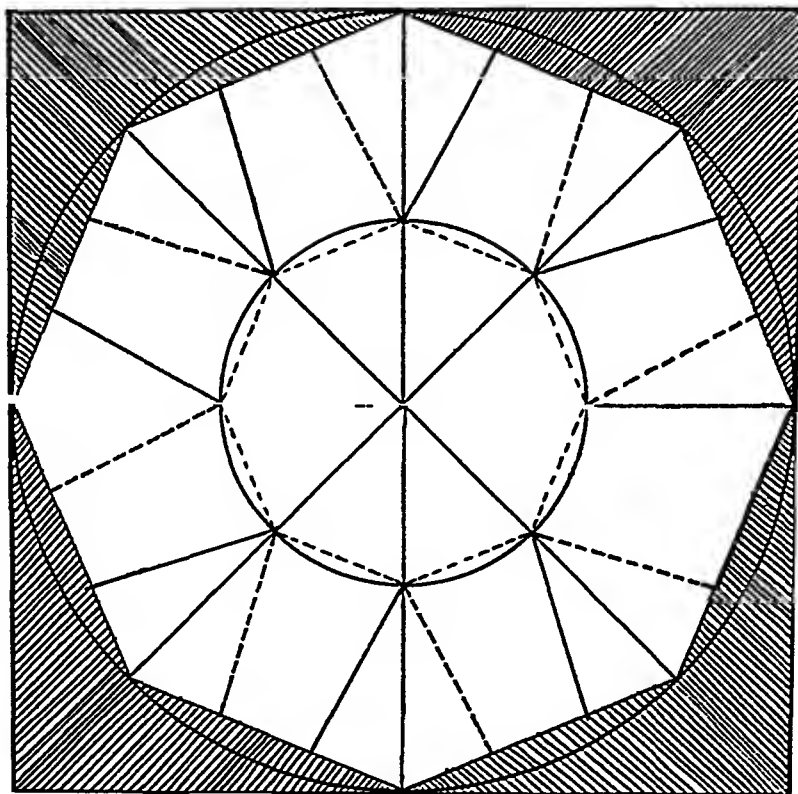
NB The word 'diameter' should not be introduced to the children at the present stage.

## LESSON IX

### OCTAGONAL TRAY OF CARTON

(a) Take carton,  $16 \times 16$  cm.; (b) fold in half and in half again (square); (c) open out and fold cornerwise in both

DIAG No 42



Octagonal tray

directions; (d) having obtained centre, draw circles; (e) draw eight chords and corner lines; (f) cut away the waste; (g) cut along the dotted lines at corners; (h) fasten the corners on the outside; (i) cut away extended portions.

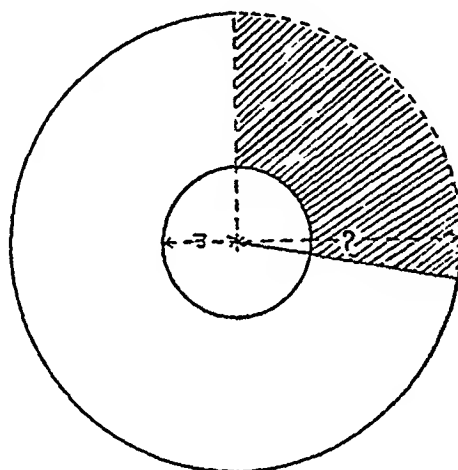
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## LESSON X

### CIRCULAR SHADE (FOR LAMP)

(a) Draw the circles; (b) cut out large circle. (c) draw lines as per diagram (one-fourth of circle) and cut away the waste. (d) cut away the inner circle. (e) fasten the two ends together

Diag No 13



Circular shade



## LESSON XI

### KITES

Diagram 44 shows three different kinds of kite. The teacher should help the children to make them correctly. They may then actually be used in games of flying kites

DIAG No 44

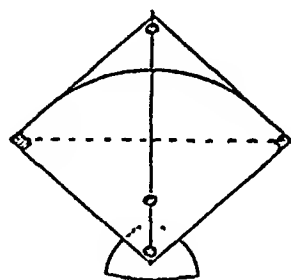


Fig A

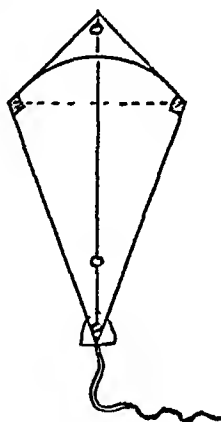


Fig B

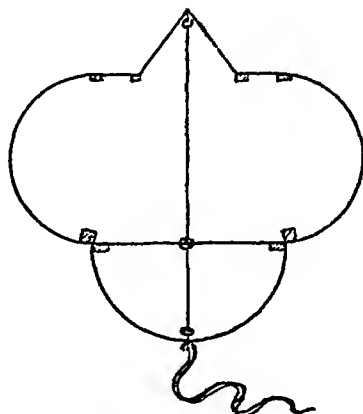


Fig C      Kites

## APPENDIX B

### CORRELATED LESSONS ON THE PREPARATORY MODELS

Before actually starting work on cardboard modelling the children should execute the preliminary exercises with paper and carton (Appendix A), which are easier materials to handle. Through these they will acquire the necessary knowledge and skill to enable them to take up the more difficult work with cardboard. Each model thus constructed should provide a number of lessons on different subjects, hints on which are included with the instructions for making the model.

## LESSON I SQUARE TRAY

Distribute squares of paper (Diagram 34.) Let the children measure all sides and comment thereon.

### *Construction.*

(a) Make lines by folding (Diagram 34); (b) cut along the lines; (c) fold on the dotted lines; (d) apply paste to flaps and fix inside.

### *Exercises.*

1. Are all the sides of the paper equal ?
2. What was the size of the paper ?
3. What is the size of the tray ?
4. What is the difference in measurement in the side and the height of the tray ?
5. Is there any difference in form between the tray and each corner flap ?
6. Are the flaps all equal ?

### *Suggestions.*

**SOCIAL STUDY.**—Social responsibilities—let the children practise the correct way of greeting the teacher and of answering questions politely—learn their names—get to know the children—let them learn to speak one at a time—observe and comment on their personal cleanliness—if necessary, let them wash their clothes.

**CRAFT WORK.**—Show the model or models—ask the children whether they would like to have one of their own and make it themselves—take the first model and allow the children to observe and then examine it—dimensions :—length, breadth, size.

Introduce the scale—show the children the inch marks—ask them how many inch marks there are—let them count aloud up to twelve.

Take a piece of paper and demonstrate how it can be made into a square tray—ask how many such pieces of paper will be needed, if each child is to make his own tray—let the children count the number present in class and the pieces of paper.

Let the children measure the pieces of paper and comment on them in accordance with the exercises enumerated in the lesson.

**MOTHER TONGUE**—Names—paper, scissors, paste—conversation during actual execution of the work

**GENERAL SCIENCE**.—If any flour paste is left over, it should be covered with a wet cloth, or it will dry up and become useless.

**Paste**:—made of flour and water—flour is white—water is colourless—demonstrate the fact by showing a glass of water—ask how the paste derived its blue colour—show a piece of blue vitriol—this is poisonous—it has been added to the paste to make it insect-proof—fingers smeared with paste should never be inserted in the mouth—ask the reason and elicit the answer from the children

**Scissors** are made of steel, and should be kept away from water and substances, such as flour paste—the effect of water on iron and steel—rust.

How to clean tools—the necessity of working only with clean hands—recapitulation of names of tools

**SOCIAL STUDY**.—When the work is finished take the children to their washing place—let them understand the advantage of going in line—see that they do not waste the water

*Recess, games, songs.*

**MOTHER TONGUE**—Story of a Chinese emperor introduced by the fact that the art of making paper was first invented in China



***Suggestions.***

**CONSTRUCTION.**—Demonstration of the model—let the children observe and examine how it is made and with the help of a scale determine the size of paper required to make it—simple oral additions.

***Arithmetic.***

Give the following exercises in addition to those given above — actual number of pieces of paper required—actual number of scissors required—actual number of working-boards required.

Write these numbers on the board and continue this process until the children visually recognise the figures.

***General Science.***

How is paste made?—let the children and teacher actually make paste—flour, water and their proportion in a cooking vessel—how do we light a fire?—let the children recount the process from their actual experience of the lighting of a fire at home.

What should we do if our clothes catch fire?—never run away—how can fire be extinguished?—it requires air to burn—without air, fire cannot burn—air is a substance, though we cannot see it—we are surrounded by air—man breathes and lives on air—closed windows prevent fresh air from coming into the room—the necessity for fresh air—wind is air in motion.

**OBSERVATION**—The effect of heat on the solution of flour and water—observation of the steam from the pot—vapour—transformation of water into vapour—demonstrate by placing a cover on the pot and showing the molecules of water on the lid—how does the solution thicken into paste?

**MOTHER TONGUE AND SOCIAL STUDIES**—Story of how primitive man lit the fire first

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### LESSON III SQUARE ENVELOPE

#### **Construction.**

(a) Cut away the waste (Diagram 36): (b) fold two opposite corners into the centre, (c) fold and paste down the third corner. (d) apply paste on the fourth corner. (e) let it dry

#### **Exercises.**

1. What is the length of one side ?
2. Are all the sides equal ? Introduce the word "square"
3. What is the total length of the four sides (perimeter) ?
4. What shape are the pieces of waste paper ? How many sides have they ? Introduce the word "triangle"
5. Measure the sides of the triangle.
6. What is the total length of all the sides of the envelope ?

NB Envelopes of different sizes should be distributed to the pupils and they should be asked to make an envelope of the same size as that given to them (see Diagram 38)

#### **Suggestions.**

An envelope—its utility—letter writing and the despatch of letters to distant places—the necessity for a knowledge of reading and writing

The exercises involved are given above.

SOCIAL STUDIES—Collection and proper disposal of waste paper—let the children take their envelopes home for the use of their parents—extension of suggestions in previous models

MOTHER TONGUE—Letter—envelope—post-office—postman—story of the postman—continuation of the story of Chinese Emperor

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## LESSON IV PROPELLER.

### *Suggestions.*

Demonstrate a model and ask if they would like to have one—the functions of a propeller—how it moves—the action of wind.

Distribute to the children square pieces of paper and pieces of strong cardboard—one inch square.

### *Construction.*

(a) Fold the paper diagonally and find out the middle point (centre); (b) paste the square piece of cardboard firmly in the centre of the paper and cut the diagonals up to the edge of the cardboard; (c) turn corners (a), (b), (c) and (d) into centre and fasten them with paste, (d) press and pin through the centre into the end of a stick or a piece of bamboo.

### *Exercises.*

1. Find out the length of the side of the square.
2. Let the children test the angles with a set-square and find that they are equal. Explain that these angles are called right-angles.
3. How many right-angles are there in a square?

N.B. Suspend the propeller in various positions to show the motion of the air.

NOTE.—The teacher should collect square scraps of cardboard and waste paper of the proper size and distribute them.

## LESSON V ENVELOPE (RECTANGULAR)

### *Construction.*

(a) Cut away the waste (Diagram 38); (b) fold the two short opposite flaps into centre; (c) fold one long flap to centre and fix on short flaps; (d) apply paste to the fourth flap and leave it to dry.

### *Exercises.*

Explain the difference between this envelope and that made in Lesson 3.

Establish the fact that the present one is rectangular and not square.

## LESSON VI OBLONG TRAY WITH SLOPING SIDES

### **Construction.**

Introduce centimetre.

(a) Fold along the lines: (b) cut away the waste. (c) fasten the flaps on the outside

### **Exercises.**

Measure the sides of the paper. Make a statement. What is its shape?

What is the difference between the length and the breadth?

NOTE :—Collect the models and stack one inside the other drawing the children's attention to the fact that objects of this kind, with sloping sides, can be packed into a small compartment. Invite examples : Thalis, katoris (cups), glasses, karai (frying pan) etc